Project Manual

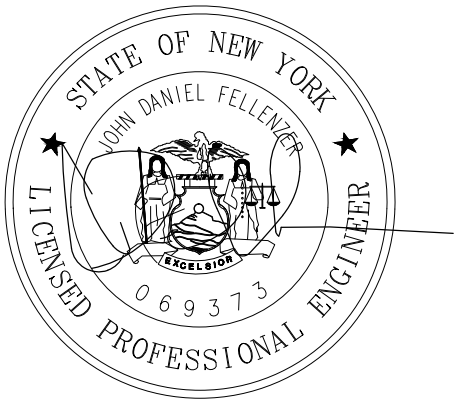
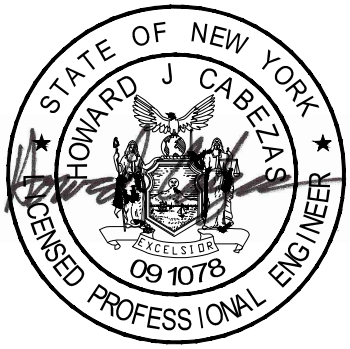
PROJECT NO.: 081056-00

PROJECT TITLE: Renovate Peregrine Dining Hall, Bldg. No. 032

DATE: 08/17/2026

State University of New York
at
New Paltz

State University Construction Fund
H. Carl McCall SUNY Building
353 Broadway
Albany, New York 12246

KSQ Design 286 Madison Ave., 22nd Floor New York, NY 10017 	**Fellenzer Engineering** 22 Mulberry St, Suite 2A Middleton, NY 10940 
Watts Architects & Engineers 95 Perry St., Suite 300 Buffalo, NY 14203 	**Cabezas Engineering PLLC** 5510 County Road 14 Alpine, NY 14805 

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F102 SECOND FLOOR FIRE PROTECTION PLAN (*08/17/26*)
F103 SECOND FLOOR / MECHANICAL MEZZ. FIRE PROTECTION PLAN (*08/17/26*)
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F202 SECOND FLOOR FIRE PROTECTION REQUIREMENTS PLAN (*08/17/26*)
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QF501-5	FOODSERVICE ELEVATION PLAN B,C (*08/17/26*)
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QF600-3	FOODSERVICE STANDARD DETAILS (*08/17/26*)
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QF600-5	FOODSERVICE STANDARD DETAILS (*08/17/26*)
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QF702-4	FOODSERVICE EXHAUST HOOD DETAIL (*08/17/26*)
QF702-5	FOODSERVICE EXHAUST HOOD DETAIL (*08/17/26*)
QF702-6	FOODSERVICE EXHAUST HOOD DETAIL (*08/17/26*)
QF702-7	FOODSERVICE EXHAUST HOOD DETAIL (*08/17/26*)
QF702-8	FOODSERVICE EXHAUST HOOD DETAIL (*08/17/26*)
QF702-9	FOODSERVICE EXHAUST HOOD DETAIL (*08/17/26*)
QF702-10	FOODSERVICE EXHAUST HOOD DETAIL (*08/17/26*)
QF702-11	FOODSERVICE EXHAUST HOOD DETAIL (*08/17/26*)
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QF800-3	ACCUMULATOR DRAWING (*08/17/26*)
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END OF SECTION 00 01 10

STATE UNIVERSITY CONSTRUCTION FUND
NOTICE TO BIDDERS

The State University Construction Fund will receive sealed Proposals for Project No.: 081056-00

Titled: Renovate Peregrine Dining Hall, Bldg No. 032 at SUNY New Paltz until 2:00 p.m.

Local Time on **09/23/2026** at the Fund's Office at the H. Carl McCall SUNY Building, 353 Broadway, Albany,

NY 12246, where such proposals will be publicly opened and read aloud in Room S201. Bidders are encouraged to view the live stream of the bid opening broadcast on the day of the bid by using the link posted on the Fund's web page: https://sucf.suny.edu/ Bidders are encouraged to submit their bids early by delivery service and use the bid modification process permitted in part (7) of Section 3 of the Information for Bidders.

All proposals and/or proposal modifications must be received and stamped in by the Fund no later than 2:00 p.m. on the bid opening date. The Proposal may be hand delivered to Room S204A or be mailed or sent by delivery service to the State University Construction Fund, H. Carl McCall SUNY Building, 353 Broadway, Albany, New York 12246. Each bid must be identified, on the outside of the envelope, with the name and address of the bidder and designated a bid for the Project titled above. When a sealed bid is placed inside another delivery jacket, the bid delivery jacket must be clearly marked on the outside "BID ENCLOSED". Proposals that are mailed to the Fund must be delivered by 1:00 p.m. on the day of the scheduled bid opening and mailed Proposals must be sent using a delivery method that provides tracking and locating the Proposal. The Fund assumes no responsibility for any Proposal that is not delivered to the aforesaid address by 1:00 p.m. on the bid opening date. See Section 3 of the Information for Bidders for additional instructions regarding proposals, including modifications. Please be advised that all individuals who access the H. Carl McCall SUNY Building to submit bids or attend bid openings will be required to present picture identification to building security officials and obtain a visitor's pass prior to entering the building. Bidder's arriving prior to 12:30 PM on the bid opening date may be asked to wait outside the building. There is no parking available for bidders at the H. Carl McCall SUNY Building and violators may be towed.

To assure delivery of their bid prior to the aforesaid deadline for receipt of bids, bidders should allow sufficient time for individuals to find public parking for their vehicles, to find the Visitor Entrance to the building, to be processed through building's health and security screening, to find the Fund's office within the building, to properly complete and submit their proposal, and to allow for delays that are typical for congested urban areas and crowded public bid openings. Due to space limitations, the Fund reserves the right to control physical access into Room S201 and direct the individuals to other spaces in the building where they can view the live stream broadcast of the bid opening on their personal electronic device.

To assure delivery of their bid modification, if any, prior to the aforesaid deadline for receipt of bids, bidders should allow sufficient time to account for internet connectivity problems, to correct email address errors, to be processed through spam filters and security software and to allow or delays that are typical for congested internet servers**.** Bidders may at any earlier time send an email to modifymybid@suny.edu alerting the Fund of your intent to modify.

All work will be completed within **900** calendar days from receipt of the Notice to Proceed.

The Fund's project specific goals for this project are _18% MBE and _12% WBE and _6% SDVOB. See Section 00 21 13 30 MWBE-SDVOB Utilization Plan Instructions dated Nov 2023. Utilization Plans shall be accepted in the ONLINE FORMAT ONLY using the Fund's web-based application; any other form of submittal will be rejected.

A pre bid conference and project walk through will be held on **09/09/2026** with all contractors assembled at (10:00am) @ SUNY New Paltz Peregrine Dining Hall. For additional information, see Section 00 25 13 PreBid Meetings.

There is no free parking on campus for those attending the walk through. Violators may be ticketed and towed.

Bidding and Contract Documents may be examined free of charge at:

Consultant's Office: KSQ Design
Ofe Pearson
286 Madison Ave., 22nd Floor
New York, NY 10017
(email) opearson@ksq.design

Campus at which the work is to be performed: SUNY New Paltz – Peregrine Dining Hall Bldg. No. 032.
Room#:
Contact Person: Michael Weatherly
Phone#: (845)-257-3949

ConstructConnect Visit www.cmdgroup.com. Email: content@constructconnect.com

Construction Journals Visit www.constructionjournal.com

Builders Exchange of Rochester 180 Linden Oaks, Suite 100, Rochester, NY 14625 www.robex.com

Construction Contractors Association (Hudson Valley) 330 Meadow Ave, Newburgh, NY 12550 www.ccahv.com

Construction Exchange of Buffalo & WNY 2660 Williams St., Buffalo, NY 14227 www.conexbuff.com

Eastern Contractors Association, Inc. 6 Airline Drive, Albany, NY 12205 www.ecainc.org

Northern NY Builders Exchange 22074 Fabco Rd., Watertown, NY 13601 www.nnybe.com

Builders Exchange of the Southern Tier 65 East Main St., Falconer, NY 14733 www.bxstier.com

Syracuse Builders Exchange 6563 Ridings Road, Syracuse, NY 13206 www.syrabex.com

Plans will be available on **08/25/2026** from **Office of Biddy c/o Long Island Blueprint, 179 New York Ave, Huntington, NY 11743** and Brenden Wyant brenden@biddyhq.com the Printer in either electronic or paper format. Bidders will be able to access the project online at the Printer's web site:

(**projects.biddyhq.com**)

Go to **projects.biddyhq.com** and select "Create bidder account." Once to Create a Bidder account page fill out the required fields and select "Create Account." Once selected you will arrive to the main dashboard page where all project hosted by Biddy will be available for viewing. Go to "Search projects" and enter "**Renovate Peregrine Dining Hall, Bldg No. 032 at SUNY New Paltz**" and hit enter. After hitting enter, the project information shall appear at the top of the list. Select the project where you will be able to gain access to "Details", "Bid Documents" and "Plan Holders".

Bidders who register as a planholder through the Printer may acquire the bidding and contract documents using the following options:

1. For a fee of ten dollars ($10), interested firms may request and receive an electronic download of the bidding and contract documents. At the bidder's expense, purchase a printed copy or copies of the bid set.

2. For a fee of ten dollars ($10), interested firms may request and receive a CD with electronic copies of the bidding and contract documents. At the bidder's expense, purchase a printed copy or copies of the bid set.

3. For a fee of $49, interested firms may request and receive a printed copy of the complete set. An electronic download or copy on CD will not be provided.

The Fund waives fees and deposits for sets of the Contract Documents requested by NYS certified Minority- and Women-Owned Business Enterprise or Service-Disabled Veteran-Owned Business Enterprise. Payments of less than $50.00 are non-refundable. Deposits of $50.00 or more will be returned to all entities who have paid the aforesaid deposit for the entire set of Bidding and Contract Documents and who return such sets to the Consultant in good condition within forty-five (45) calendar days after the opening of bids, not exceeding five (5), so returned to the Consultant.

Bids must be submitted in duplicate in accordance with the instructions contained in the Information for Bidders. A Bid Security will be required for each bid in an amount not less than five (5) percent of the Total Bid. To provide for an efficient bid opening, do not include documents other than your Proposals and securities in your bid envelope. It is the policy of the State of New York and the Fund to encourage minority and women-owned business enterprise participation in this project by contractors, subcontractors and suppliers. All bidders are expected to cooperate in implementing this policy.

Please be advised that the Fund's insurance requirements are contained in Schedule A of Attachment A of the Construction Agreement. All insurance must be provided by companies approved by the Fund and be either licensed (admitted) by the New York State Department of Financial Services (NYS DFS) to issue insurance in the State of New York or authorized by NYS DFS and have an A.M. Best Company rating of "A-" Class "VII" or better. All successful bidders will be required to furnish a Performance Bond and a Labor and Material Bond pursuant to State Finance Law for 100% of the amount of the Contract.

Please visit https://sucf.suny.edu/sites/default/files/docs/BidandPostBidChecklist.pdf and download the "Bid and Post Bid Checklist" that gives bidders a one page summary of how to be prepared when bidding.

Please note that Sections 139-j and 139-k of the State Finance Law imposes certain restrictions on communications between the Fund and bidders during the procurement process. Pursuant to those sections of law, the Fund designates the following email addresses for persons to which communications concerning this procurement may be sent:

SUCF.ConstructionBids@suny.edu to contact one of the following people:
Robbilee Luedtke (518) 320-1837, Samantha Lord, Jeremy Clausi, or Kelly Whitbeck.

SUCF.OpportunityAdmin@suny.edu for MWBE SDVOB issues only to contact the following person:
Scott Clay.

SUCF.Insurance@suny.edu for insurance issues only.

Contact with other than the above-designated Fund employees concerning this procurement may result in the rejection of your bid. To purchase plans or for technical inquiries specific to this project, please contact the Architect or Engineer of Record.

Notice on Vendor Responsibility Questionnaires (CCA-2): The CCA-2 has been updated by the Office of the State Comptroller and submission of the updated CCA-2 will be required for any bids received after 9/1/2022; however, the updated CCA-2 may be used prior to this date. It is recommended that bidders and nominated subcontractors review and re-certify their CCA-2 as soon as feasible. See Information for Bidders Section 8, Submission of Post Bid Information, for additional information.

INTEGRITY HOTLINE: As part of its Corporate Integrity Program, the Fund operates an Integrity Hotline 24-hours a day, seven-days a week. If you have knowledge of or suspect fraudulent, unethical, or other misconduct on a Fund project, please call the Hotline toll-free at 866-543-8107 or locally at 518-320-1525. All calls will be received and reviewed only by the Corporate Integrity Officer. Calls can be made anonymously or on a confidential basis. The identity of confidential callers will be fully protected. The Hotline is not equipped with Caller ID and no effort will be made to identify anonymous callers.

The Fund reserves the right to reject any or all bids.

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On bid day, bidders must:

- Be aware of the requirements of the **project specific** Section 00 21 13 10 Notice to Bidders.
- Be aware of the requirements of the **project specific** Section 00 21 13 20 *Information for Bidders*.
- Provide two (2) complete original **project specific** Proposals per Sections 3 and 5 of the *Information for Bidders.* **Proposals with major informalities will be rejected.**
  - Attachment A of the Proposal (List of Completed Similar Construction Contracts) must be completed. **Do not submit a blank form** or insert "refer to attached lists".
  - Before completing Attachment A, read the **project specific** requirements of Section 7 Qualification of Bidders and Section 01 11 00 Description of Work (Section A).
- Provide two (2) complete original Bid Bonds per the Instructions for Execution of Bid Bond and Acknowledgment, or other bid security per Section 6 of the *Information for Bidders.*
  - Use the Fund's form of Bid Bond with date Dec 2015 in the lower right-hand corner.
- Deliver the Proposals and bid security **using the special bid envelope** per the *Notice to Bidders.*
- Be in compliance with NYS Dept. of State registration requirements. Nominated subs must also comply. Business entities must be in the DOS database. Search for entities at this web site:
  - https://apps.dos.ny.gov/publicInquiry/
- Be aware that all insurance must be provided by companies approved by the Fund, have an A.M. Best Company rating of "A-" Class "VII" or better, and such companies must be either 1) licensed by the New York State Department of Financial Services (NYS DFS) or 2) authorized by NYS DFS to issue insurance in the State of New York.
    - Please consult your insurance agent prior to bidding, who should be made aware of the requirements of Agreement Section 5.06 Insurance and Schedule A.
    - Certificates of Insurance must be in the formats required by Schedule A of Attachment A.
- Be aware of project specific physical conditions and subsurface conditions that could reasonably anticipated from the provisions of the Contract Documents, Section 00 31 00 Available Project Information (if applicable), and other information available to bidders and from the bidder's own inspection and examination of the site.

Post bid, bidders must:

1. Within 48 Hours after the time of the Bid Opening:
   - Provide a completed Appendix "A" per Section 8(1)d of the *Information for Bidders.*
   - Provide a completed NYS Vendor Responsibility Questionnaire **For-Profit Construction** (CCA-2) per Section 8(1)a of the *Information for Bidders.*
     - Confirm your CCA-2 shows financial information required by Section 7(2) of the *Information for Bidders.*
     - Confirm your CCA-2 Attachment A shows completed construction contract information required by Section 7(3) of the *Information for Bidders.*
     - Confirm your CCA-2 includes the additional information requested for "Yes" responses, if any.
     - Confirm your CCA-2 Attachments A and B show current information for owners, architects and their current telephone numbers for contracts listed.
   - Provide names of proposed subcontractors and Attachment A's showing their experience per Section 8(1)c.iv of the *Information for Bidders.*

- Provide detailed descriptions of work for projects listed in Attachment A of your Proposal (List of Completed Similar Construction Projects) if such descriptions did not fit or if requested by the Fund.
- Cooperate with the Fund's Consultant and provide other information they may reasonably require to evaluate your bid in detail.

2. Within seven days after the time of the Bid Opening:

- Provide CCA-2 for each proposed subcontractor per Section 8(1)c of the *Information for Bidders.*
  - Confirm the CCA-2 includes the additional information requested for "Yes" responses.
  - Confirm the CCA-2 Attachments A and B show construction contract information for owners, architects and their current telephone numbers.
- Provide an MWBE Utilization Plan per Section 8(3) of the *Information for Bidders.*
- Provide an EEO Statement and Plan per Section 8(4) of the *Information for Bidders.*
- Provide a Construction Schedule per Section 8(5) of the Information for Bidders.
- Provide proof of workers' compensation, disability benefits insurance coverage, and as requested, names of all insurance carriers.
  - This is the Workers Comp/Disability link for employers: http://www.wcb.ny.gov/content/main/Employers/Employers.jsp
  - This is the link with a description of the required forms for Workers Compensation and Disability: http://www.osc.state.ny.us/agencies/guide/MyWebHelp/Content/XI/18/G.htm

3. Prior to the Fund sending you a Notice of Award letter:

- Provide additional information per Section 8(5) of the *Information for Bidders, if requested.*

4. After your receipt of the Notice of Award letter, provide the following by the date stipulated in the letter transmitting the Notice of Award:

- Sign and complete the Contractor's portion of the **Project Specific** Agreement sent to you by the Fund.
- Provide required bonds per Section 10 of the *Information for Bidders.*
- Provide the 120-day Construction Schedule required by the General Requirements, Special Conditions paragraph titled "Project Schedule."
- Provide the completed insurance forms per Sections 5.06 and 5.07 of the Agreement.

5. Prior to starting work:

- Be in receipt of the Notice to Proceed letter issued by the Fund.

Special Notice

Please be advised that Part 10 of the Proposal you signed requires your office to be timely and responsive in your submissions of information requested by the Fund or Consultant.

The Fund may begin the process to exercise its rights regarding your bid bond and/or making an adverse determination of responsiveness if you do not provide your proper and timely attention to our requests.

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STATE UNIVERSITY CONSTRUCTION FUND

SECTION 00 21 13 20 - INFORMATION FOR BIDDERS

Section 1 Definitions

All definitions set forth in the Agreement are applicable to the Notice to Bidders, Information for Bidders and the Proposal, all of which documents are hereinafter referred to as the Bidding Documents.

Section 2 Issuance of Bidding and Contract Documents

Drawings and a Project Manual binding Bidding Documents, Contract Documents, and Technical Specifications will be issued by the Consultant upon request after payment of the deposit specified in the Notice to Bidders.

Section 3 Proposals

(1) Proposals must be submitted in duplicate on the forms provided by the Fund. They shall be addressed to the Fund in a sealed envelope, provided by the Fund, marked with the name and address of the bidder, the title of the Project and the Project number. The Fund accepts no responsibility for Proposals that may be delivered by any courier or other messenger service that does not contain all of the above-noted information on the outside of a sealed envelope. Facsimile or email copies of the Proposal will not be accepted by the Fund.

(2) All blank spaces in the Proposal must be filled in and, except as otherwise expressly provided in the Bidding Documents; no change is to be made in the phraseology of the Proposal or in the items mentioned therein.

(3) Proposals that are illegible or that contain omissions, errors, alterations, additions or items not called for in the Bidding Documents may be rejected as informal. In the event any bidder modifies, limits or restricts all or any part of its Proposal in a manner other than that expressly provided for in the Bidding Documents, its Proposal may be rejected as informal.

(4) Prices inserted shall be in whole dollar amount but if cents are inserted, the Fund shall round the amount down to the nearest whole number. Any Proposal may be considered informal which does not contain prices in words and figures in all of the spaces provided or which is not accompanied by a bid security in proper form.

   a. In case any price shown in words and its equivalent shown in figures do not agree, the written words shall be binding upon the bidder. In case of a discrepancy in the prices contained in the Proposal forms submitted in duplicate by the bidder, the Proposal form which contains the lower bid shall be deemed the bid of the bidder; provided, however, the Fund at its election may consider the Proposal of such bidder informal.

(5) If the Proposal is made by a corporation, the names and places of residence of the president, secretary and treasurer shall be given. If by a partnership, the names and places of residence of the partners shall be given. If by a joint venture, the names and addresses of the members of the joint venture shall be given. If by an individual, the name and place of residence shall be given.

(6) No Proposal will be considered which has not been deposited with the Fund at the location designated in and prior to the time of opening of bids designated in the Bidding and Contract Documents. However, if a Proposal deposited with the Fund prior to the opening of bids is misplaced by the Fund and not opened by the Fund at the designated time of opening, then the Fund, in its sole discretion, may open such Proposal as soon as possible after the misplaced Proposal is discovered and confirmed to have been misplaced by the Fund. If the Fund decides to open such Proposal, the Fund will make reasonable attempts to notify the other bidders and allow such other bidders to view such opening by Webex or equivalent broadcast. Unopened Proposals will be returned to the bidder.

(7) Except as set forth herein, bids may be modified or withdrawn prior to the time of opening of bids as designated in the Bidding and Contract Documents only in writing or by email notice received by the Fund.

a. A written or email notice of modification or withdrawal shall be marked by the bidder with the name and address of the bidder, the title of the Project and the Project number. Upon receipt by the Fund, a duly authorized employee of the Fund shall note thereon the date and time of receipt and shall thereupon attach said written or email notice of modification or withdrawal to the envelope submitted by the bidder pursuant to subdivision (1) of this Section. Bid Modification email address: modifymybid@suny.edu . Submit modification amount only, (i.e., “deduct” or “add” $XXX, not revised total bid amount. For email notice, submit modification as an attachment in portable document format (PDF) on bidder’s letterhead signed by a duly authorized representative of the bidder.

b. In the event an employee or courier of the bidder deposits the bidder’s Proposal on the day of the bid opening and subsequently asks for its return to make modifications prior to the designated time of opening, the Fund, in its sole discretion, may refuse to return a Proposal unless such employee or courier presents reasonable proof that he/she is duly authorized by the bidder and, if returned by the Fund, require that the Proposal be properly re-deposited with the Fund prior to the designated time of opening. The Fund accepts no responsibility for Proposals returned to duly authorized employees or couriers that may subsequently be deposited after the designated time for opening or modified in an informal manner or modified in a manner not acceptable to the bidder.

(8) Except as set forth herein or as permitted by law and unless the Fund is of the opinion that it is in the public’s best interest to permit the same, permission will not be given to modify, explain, or withdraw any Proposal or part thereof after the time designated in the Bidding and Contract Documents for the opening of bids.

(9) Withdrawal of Bid After the Bid Opening

a. Unless another time is permitted by the Fund in writing, within five (5) business days of the bid opening or of notification that the previous low bidder has been rejected or permitted to withdraw, a bidder may request, in writing by email to the Fund, the withdrawal of its bid on bidder’s letterhead signed by a duly authorized representative of the bidder who signed the Proposal.

b. The Fund may conduct or have conducted a fact-finding proceeding to develop information concerning the request for withdrawal. A request for withdrawal of a bid made after the specified number of days allowed may result in forfeiture of the bid security.
c. Following a timely request for withdrawal of a bid, the bid security may be returned if the bidder establishes by credible evidence, including original documents when requested, the following:

    i. An error, clerical as opposed to judgmental in nature and verifiable by written evidence, occurred in the computation of the bid,
    ii. The error constitutes either an unintentional and substantial computational error or an unintentional omission of a substantial quantity of labor and/or material from the final bid computation,
    iii. Award of the contract to the bidder at the amount of the bid would cause financial hardship to the bidder,
    iv. Withdrawal of the bid is permitted by law or in the public's best interest, and
    v. The absence of gross negligence in the preparation of the bid. For the purposes of this subparagraph, gross negligence includes, but is not limited to: (1) the apparent failure of a bidder to account for two or more categories (divisions) of work; (2) the bidder's use of multiple erroneous quotations from subcontractors or suppliers; (3) the bidder's failure to obtain valid quotations from qualified subcontractors, suppliers, or insurance carriers; (4) the bidder's failure to properly account for the minimum qualifications of a bidder in Section 7 herein, or (5) submission to the Fund of a bid withdrawal request within the preceding six (6) months or other period previously agreed to by the Fund and the bidder.

d. Required documentation in support of a request for withdrawal of bid includes, but is not limited to the following:

    i. A narrative that describes the sequence of events that led to submitting a purported errant proposal and the bidder's reasons for its request to withdraw the proposal
    ii. Take-off sheets, printed copies of electronic estimates, if applicable
    iii. Annotations on the bid documents to show where the purported error occurred (annotations can provide the narrative explanation of the purported error and how it occurred as indicated in item i. above)
    iv. Calculations for the bid as submitted compared with alternative calculations to the bid that eliminate the purported error
    v. Documentation demonstrating the financial impact to bidder to perform the project for the amount initially bid.

e. If the bidder fails to provide the necessary documentation or fails to meet its burden of proof, the Fund may deny the request to withdraw without penalty and find the bidder nonresponsive. The decision of the Fund shall be made in its sole discretion and shall be final and conclusive. The Fund will advise the bidder in writing of its determination. In the event the Fund denies the bidder's request to withdraw without penalty, the bidder's bid security may be forfeited and become the property of the Fund. At the discretion of the Fund, in lieu of forfeiture of bid security, the Fund may offer the bidder an alternate resolution as may be agreed to by the parties.
f. Once a request to withdraw is made, the bidder is ineligible for award. Upon receipt of a request to withdraw, the Fund shall continue to progress the award process considering only the remaining bids.

(10) Protesting the Bid Results after Bid Opening

Not more than ten (10) business days after the bid opening, a bidder may submit a written protest challenging the bid results following the procedure available on the Fund website at the following location:

https://sucf.suny.edu/sites/default/files/docs/ContractAwardProtestProcedure.pdf

Section 4 Examination of Bidding and Contract Documents

(1) Prospective bidders shall examine the Bidding and Contract Documents carefully and, before bidding, shall make written request(s) to the Consultant (with a copy thereof to the Fund) for an interpretation or correction of any ambiguity, inconsistency, or error therein which should be discovered by a reasonably prudent bidder.

a. Requests should be made as far in advance of, but not later than, the date and time scheduled for receipt of bids. In the judgment of the Fund, it may be impractical to address requests that are submitted too close to the bid opening date.
b. Requests for use of equivalent products shall comply with Section 2.20 of the Agreement.
c. Such interpretation or correction as well as any additional Contract provision(s) the Fund shall decide to include will be issued in writing by the Consultant as an Addendum, which will be sent to each person recorded as having received a copy of the Bidding and Contract Documents from the Consultant, and which also will be available at the places where the Bidding and Contract Documents are available for inspection by prospective bidders.
d. Such interpretation or correction or additional Contract provision(s) issued by Addendum may not satisfy a bidder's request nor result in Bidding and Contract Documents that are without ambiguity, inconsistency or error. Post bid, requests for interpretations or corrections may be made after execution of the Agreement in accordance with Section 01 26 13 Requests for Information of the General Requirements and Sections 1.06, 2.01, 2.02, and 2.08 of the Agreement.
e. Such Addendum will become a part of the Bidding and Contract Documents and will be binding on all bidders whether or not the bidder receives or acknowledges the actual notice of it. Prospective bidders are responsible for ensuring that all Addenda have been incorporated into the bid. The requirements contained in all Bidding and Contract Documents shall apply to all Addenda.

(2) Only the written interpretation or correction so given by Addendum shall be binding.

a. Prospective bidders are warned that no trustee, officer, agent or employee of the Fund, Campus, or the Consultant is authorized to explain or interpret the Bidding and Contract Documents by any other method, and any such explanation or interpretation, if given, must not be relied upon.
b. The Fund has no obligation to provide responses.

Section 5 Computation of Bid

(1) In computing their bids, bidders are not to include the sales and compensating use taxes of the State of New York or of any city and county in the State of New York for any supplies or materials which are incorporated into the completed Project as the same is exempt from such taxes.

(2) Unit prices may be inserted in the Proposal by the Fund or the bidder at the discretion of the Fund. Unit prices shall be calculated using the quantity and dollar amounts for the corresponding allowance shown in the Proposal.

a. In the event the Proposal contains blank spaces for unit prices or the Fund elects to adjust any unit price filled in by a bidder, the inserted or adjusted amount shall be agreeable to both the bidder and the Fund, or, in its sole discretion, the Fund may reject any unit prices.
b. In the case of rejection of unit prices by the Fund, the bidder acknowledges that the amount of work in the corresponding allowance shall be performed within the amount of its base bid.
c. If any unit price calculations shown in words and its equivalent shown in figures do not agree with the amounts shown for the corresponding allowance, the written words of the corresponding allowance shall be binding upon the bidder.
d. Unit prices will not be used to determine the low bidder.

(3) If alternates are included in the bidding documents, the Fund reserves the right to accept or reject any or all alternates.

a. The Fund shall determine the lowest bid by adding to or deducting from the Total Bids of the bidders, the additive or deductive alternates, if any, that the Fund elects to accept after the opening of the bids.
b. Alternates will be accepted in the order they are set forth in the Proposal.
c. Alternates, if any, are described in Section 01 23 00 (Section B) of the Technical Specifications.
d. Rejected alternates will not be used in combination with the Total Bid and other accepted alternates, if any, to determine the low bidder.
e. Alternates will be accepted or rejected at the sole and absolute discretion of the Fund.

Section 6 Payment of Bid Security

(1) Each Proposal must be accompanied by the required amount of the bid security in the form of a bank draft or certified check, payable at sight to the Fund and drawn on a bank authorized to do business in the United States, or by a Bid Bond, on a form approved by the Fund, duly executed by the bidder as principal and having as surety thereon a surety company or companies, approved by the Fund, authorized to do business in the State of New York as a surety. Attorneys-in-fact who execute a Bid Bond on behalf of a surety must affix thereto a certified and effectively dated copy of their power of appointment.

(2) The Fund will return, without interest, the bid security of a bidder, unless such security be in the form of a Bid Bond which will not be returned by the Fund, in accordance with the following procedure:

a. To all bidders except the apparent three (3) lowest bidders within two (2) working days after the opening of bids.
b. To any bidder submitting a Bid Bond, meeting the requirements of paragraph (1) hereof, after the opening of bids, as a substitute for a bank draft or certified check within two (2) working days after the Fund's approval of such Bid Bond.
c. To the apparent three (3) lowest bidders, unless their bid security was previously returned, within two (2) working days after delivery to the Fund by the successful bidder of the executed Agreement and required Bonds, or within two (2) working days of the Fund's rejection of all bids or within two (2) working days after the expiration of forty-five (45) calendar days after the

bid opening or within the time to which the issuance of a Notice of Award may have been extended, whichever event shall occur last.

(3) The Fund reserves the right to deposit bid security drafts or checks pending final disposal of them.

(4) Where the bidder was not responsive in providing the complete Post Bid Information required under Section 8 of the Information for Bidders within the time specified by the Fund and doesn't provide a reasonable extension of the 45-day award period, the Fund may reject the bid as nonresponsive and retain the bid security.

Section 7 Qualifications of Bidders

(1) A bidder must demonstrate, to the satisfaction of the Fund, that it has successfully completed, within the last ten (10) years, three (2) contracts similar in size, scope and complexity to this contract, one of which is a single bid contract as described in Section 14.

a. For scope and complexity, similar work is defined as (i.e., roofing, window replacement, door replacement and related construction, boiler replacement, electrical upgrades, mechanical upgrades, site utility upgrades, new building, demolition and asbestos abatement; define complexity: i.e., at least one of the proffered contracts must be a single bid contract in accordance with the below Section 14, etc.) work, as further described in the General Requirements, Section 01 11 00, Description of Work.

b. The details of the bidder's relevant contract experience shall be submitted on Attachment A of the Proposal, "List of Completed Similar Construction Contracts" (the List).

i. If the List is not provided or is missing information, and/or is found to have erroneous information or information that is no longer current, a Proposal may be rejected as not responsive.

ii. If requested by the Fund, the bidder may be permitted to add missing information, modify and/or explain erroneous information or information that is no longer current on the List. Modifications and/or explanations of the List must be received within 48 hours of receipt of the Fund's request.

c. The determination of relevant contract experience in terms of size, scope and complexity will be at the sole and absolute discretion of the Fund. In making its determination, evaluation of a bidder's experience may include, but is not limited to, the following:

i. Size may be evaluated by comparing the amount of the Total Bid to the dollar value of the bidder's relevant contract amounts with reasonable adjustments for cost changes over time and/or geographic location.

ii. Size may also be evaluated using other quantities such as area, volume of work completed, or other criteria determined by the Fund.

iii. The definition of completion of the relevant contracts shall be the date the contract was substantially completed and ready for its intended use as defined in Section 1.01 of the Agreement.

iv. Size and/or time limits may be relaxed approximately 5% for uncertainties related to the bid calculation and/or timing of the actual receipt of bids versus a completed relevant contract.

v. Scope and Complexity may be evaluated by comparing the scope of the work included in the Total Bid to the work in the bidder's relevant contracts. Similar work provides essentially the same intended work results as contemplated in the work included in the Total Bid. At the discretion of the Fund, similar work may reasonably differ in details of form of contract, timing, size, form, materials, methods, configuration, operation, appearance, and in other objective and aesthetic characteristics.

vi. The form of contract for the relevant contract(s) on the List shall be a single bid prime contract for all work, as defined in Section 14 of the Information for Bidders, or equivalent contract types in which the bidder can demonstrate that it performed work of essentially the same construction scope and complexity of the work bid.

(2) All prospective bidders must demonstrate to the satisfaction of the Fund that they have the skill and experience, as well as the necessary facilities, ample financial resources, ability to manage staff and subcontractors effectively, ability to anticipate and plan construction work for optimal progress, ability to create, strive for and maintain working environments and relationships that are constructive, communicative and cooperative, organization and general reliability to do the work to be performed under the provisions of the Contract in a satisfactory manner and within the time specified.

(3) Each bidder must demonstrate to the satisfaction of the Fund that it has working capital available for the Project upon which it is bidding in an amount equal to 15 percent of the first $100,000 of the amount of its Total Bid plus 10 percent of the next $900,000 plus 5 percent of the remainder of its Total Bid. Working capital is defined as the excess of current assets over current liabilities. The Fund defines current assets as assets which can be reasonably expected to be converted into cash within a year, and current liabilities as debts which will have to be paid within a year.

(4). The Fund may make such investigation as the Fund deems necessary to determine the responsibility of any bidder or to determine the ability of any bidder to perform the Work. Bidders shall furnish to the Fund all information and/or data required by the Fund, including complete financial data, within the time and in the form and manner required by the Fund. The Fund reserves the right to reject any bid if the evidence required by the Fund is not submitted as required or if the evidence submitted by or the investigation of any bidder fails to satisfy the Fund that the bidder is responsible, or is able or qualified to carry out the obligations of the Contract or to complete the Work as contemplated.

(5) At the time of the bid opening, all bidders and subcontractors, domestic and foreign, must be in compliance with New York State business registration requirements. Contact the NYS Department of State regarding compliance.

Section 8 Submission of Post-Bid Information

(1) Within forty-eight (48) hours after the opening of bids, each of the apparent three lowest bidders, unless otherwise directed by the Fund or as otherwise provided in the Bidding and Contract Documents, shall submit to both the Fund and the Consultant:

a. Evidence of a completed New York State Uniform Contracting Questionnaire (Vendor Responsibility Questionnaire For-Profit Construction (CCA-2)). Email confirmation that the bidder's CCA-2 is current and certified in the New York State VendRep System (VendRep)

within the last six months from the bid date or, if not enrolled in VendRep, deliver a certified paper format CCA-2, including all attachments, to the Fund.

The Fund recommends that vendors file the required CCA-2 online via the VendRep. To enroll in and use the VendRep, see the VendRep Instructions at http://www.osc.state.ny.us/vendrep/vendor_index.htm or go directly to the VendRep o https://onlineservices.osc.state.ny.us/Enrollment/login?0. To request assistance, contact the Office of the State Comptroller's ("OSC") Help Desk at 866-370-4672 or 518- 408-4672 or by email at ciohelpdesk@osc.state.ny.us.

The paper format CCA-2 and accompanying definitions are available on the OSC website at the following location:

http://www.osc.state.ny.us/vendrep/forms_vendor.htm

Paper format CCA-2 will not be accepted from a bidder who is enrolled in VendRep.

b. Not used.

c. The names and addresses of the bidder's proposed subcontractor for the Asbestos Abatement and/or hazardous material removal work of any value, and proposed subcontractors for Electrical Work, the Heating, Ventilating and Air-Conditioning Work and the Plumbing Work for each of said work categories valued at $20,000 or more.

i. For each proposed subcontractor named, provide a completed "List of Completed Similar Construction Projects (the List)." If the List is not provided or is missing information, and/or is found to have erroneous information or information that is no longer current, a proposed subcontractor may be rejected. If requested by the Fund, the bidder may be permitted to add missing information, modify and/or explain erroneous information or information that is no longer current on the List; modifications and/or explanations of the List must be received promptly after receipt of the Fund's request.

ii. Only one proposed subcontractor should be named for each of such trades. Proposed subcontractors of the bidder may not be changed except with the specific written approval of the Fund.

iii. The naming of the bidder itself for any of such work is not acceptable and may result in rejection of the bidder unless the bidder can demonstrate to the Fund that it has successfully completed or substantially completed three (3) contracts similar in size, scope and complexity for the designated work within the last five (5) years. Such completed contracts shall include significant portions of self-performed work. The determination of relevant contract experience in terms of size, scope and complexity will be at the sole discretion of the Fund as described in Section 7(1)c above.

iv. The bidder will be required to establish, to the satisfaction of the Consultant and the Fund, the reliability and responsibility of each of their said proposed subcontractors to furnish and perform the work described in the sections of the Specifications pertaining to each of such proposed subcontractors' respective trades. By submission of the "List of Completed Similar Construction Projects," a proposed subcontractor must be able to demonstrate that they have successfully completed or substantially completed three

(3) contracts similar in size, scope and complexity for the designated work within the last five (5) years. The determination of relevant contract experience in terms of size, scope and complexity will be at the sole discretion of the Fund as described in Section 7(1)c above.

v. For each of the proposed subcontractors, the bidders must submit to the Fund, seven (7) calendar days after the bid opening, evidence of a completed New York State Uniform Contracting Questionnaire (Vendor Responsibility Questionnaire For-Profit Construction (CCA-2)). Either email confirmation that the subcontractor's CCA-2 is current and certified in the New York State VendRep System (VendRep) within the last six months from the bid date, or deliver a certified paper format CCA-2, including all attachments, to the Fund. Paper format CCA-2 will not be accepted from a proposed subcontractor who is enrolled in VendRep.

vi. In the event that the Fund and the Consultant reject any of said proposed subcontractors or the bidder itself for any of such subcontract work, the bidder, within two (2) working days after receipt of notification of such rejection, shall again submit to the Fund and the Consultant the name of another proposed subcontractor in place of the one rejected and it will be required to establish to the satisfaction of the Fund and the Consultant the reliability and responsibility of said proposed subcontractor. When naming another proposed subcontractor, the bidder must promptly submit the proposed subcontractor's completed "List of Completed Similar Construction Projects" and evidence of their completed CCA-2.

vii. Where the bidder designated itself for any of the aforesaid categories of work and was approved by the Fund, the bidder will not be permitted to submit another proposed subcontractor for such categories of work except where its performance of such work meets a condition(s) set forth in Section 2.26 of the Construction Agreement as determined by the Fund.

viii. Proposed subcontractors of the bidder, approved by the Fund and the Consultant, must be used on the work for which they were proposed and approved, and they may not be changed except with the specific written approval of the Fund.

c. A breakdown of the amount of the bidder's Proposal. Such breakdown shall be prepared in accordance with the format included herein as Appendix "A". No bidder shall be barred from revising, in the Contract breakdown required under the provisions of Section 4.08 of the Agreement, the various amounts listed in the bid breakdown required under the provisions of this Section. The amount set forth in said bid breakdown will not be considered as fixing the basis for additions to or deductions from the Contract consideration.

(2) Within seven (7) calendar days after the opening of bids, the three low bidders shall submit to the Fund for its approval a Service-Disabled Veteran-Owned Businesses Utilization Plan. The three lowest bidders will receive an email containing instructions and a hyperlink to follow to complete their Utilization Plan electronically via the Fund's online Utilization Plan application. Utilization Plans will only be accepted in this online format; any other form submittals will be rejected. The Utilization Plan shall include the subcontractor/supplier description of work, the estimated work schedule, and the estimated dollar value of subcontracts and supply contracts that will be awarded to Service-Disabled Veteran-Owned Businesses.

(3) Except for Contracts of $100,000 or less, and unless otherwise directed by the Fund, within seven (7) calendar days after the opening of bids, the three low bidders shall submit to the Fund for its approval, a Minority and Women-owned Business Enterprise Utilization Plan. The three lowest

bidders will receive an email containing instructions and a hyperlink to follow to complete their Utilization Plan electronically via the Fund's online Utilization Plan application. Utilization Plans will only be accepted in this online format; any other form submittals will be rejected. The Utilization Plan shall include the subcontractor/supplier description of work, the estimated work schedule, and the estimated dollar value of subcontracts and supply contracts that will be awarded to Minority and Women-owned Business Enterprises. The Utilization Plan should include the description of work and the estimated dollar value of subcontracts and supply contracts that will be awarded to Minority and Women-owned Business Enterprises.

(4) Except for contracts of $100,000 or less, within seven (7) calendar days after the opening of bids, the three low bidders shall submit to the Fund for its approval, an Equal Employment Opportunity Statement.

(5) Within seven (7) calendar days after the opening of bids, submit a working plan and schedule showing the bidder's sequence logic for all significant activities and phases of the work from the anticipated start date to the substantial completion date in the bidder's Proposal. Use suitable charts, diagrams or bar graphs and show clearly, in sequence and timescale, all significant activities and phases with time estimates for each. If requested, revise the working plan and schedule until they are satisfactory to the Fund and the Consultant. This requirement is in addition to and not a substitute for the schedule requirements of Section 10 paragraph 1(c) herein or Section 3.02 (Time Progress Schedule) of the Agreement. Although the working plan and schedule submitted shall not be used in determining the lowest responsible bidder, failure to submit or revise the working plan and schedule may result in the rejection of the Proposal as not responsive.

(6) The above information and such other information as the Fund or the Consultant may request or obtain will be used by the Fund in determining the reliability and responsibility of the bidder and any proposed subcontractors. Each bidder must comply promptly with all requests by the Fund and the Consultant for information and must actively cooperate with the Fund and the Consultant in their efforts to determine the qualifications of the bidder and any proposed subcontractors. Failure to comply with the latter may result in the rejection of the Proposal as not responsive. All information required to be furnished to the Fund under this Section shall be sent to the State University Construction Fund, Director of Capital Procurement, H. Carl McCall SUNY Building, 353 Broadway, Albany, New York 12246 or emailed to the Fund at SUCF.ConstructionBids@suny.edu unless a signed original is required to be submitted.

Section 9 Award of Contract

(1) The award of the Contract shall be made to the bidder submitting the lowest Total Bid that is responsive to the solicitation and who, in the sole opinion of the Fund, is qualified to perform the work involved and is responsible and reliable.

(2) The Field Order allowance may be reduced at the sole discretion of the Fund to a lower amount at the time of award of the contract.

(3) The right is reserved, if, in the Fund's judgment, the public interest will be promoted thereby, to reject any or all Proposals, to waive any informality in any Proposal received or to afford any bidder an opportunity to remedy any deficiency resulting from a minor informality or irregularity. Without limiting the generality of the foregoing:

a. A Proposal may be rejected as not responsive if the bidder fails to furnish the required bid security or to submit the information and/or data required with its Proposal and by this Information for Bidders.

b. A Proposal may be rejected as not responsive if the bidder cannot show to the satisfaction of the Fund: (i) that it has the necessary qualifications and capital; or (ii) that it owns, controls or can procure the necessary plant and equipment to commence the work at the time prescribed in the Contract and thereafter to prosecute and complete the work at the rate, or within the time specified; or (iii) that it is not already obligated by the performance of so much other work as is likely to delay the commencement, prosecution or completion of the work contemplated by the Contract.

c. A Proposal will be rejected as not responsive if it does not provide for the completion of the work by the date of completion specified in the Proposal.

(4) The Fund also expressly reserves the right to reject any Proposal as not responsive if, in its opinion, considering the work to be performed, the facts, as to the bidder's past performance on completed contracts, business or technical organization, plant, financial and other sources of business experience compared with the work bid upon, justify rejection.

(5) The award of the Contract shall not be construed as a guarantee by the Fund that the plant, equipment and the general scheme of operations and other information and/or data submitted by the bidder with or after its Proposal is either adequate or suitable for the satisfactory performance of the work. As a condition of the award, the bidder agrees to preserve all estimates and documentation used to develop its Bid Proposal and produce the latter information for the Fund's examination upon notice from the Fund prior to the Fund's approval of the Final Payment application required by the Contract.

Section 10 Required Bonds and Insurance

(1) Unless otherwise agreed to by the Fund, within ten (10) working days after the receipt of Notice of Award, the Contractor shall procure, execute and deliver to the Fund and maintain, at its own cost and expense:

a. A Performance Bond and a Labor and Material Bond, both of which Bonds shall be on the form prescribed by the Fund and in an amount not less than 100 percent of the total amount of the Contract awarded to the Contractor by the Fund. Said Bonds must be issued by a surety company approved by the Fund and authorized to do business in the State of New York as a surety. Attorneys-in-fact who execute said Bonds on behalf of a surety must affix thereto a certified and effectively dated copy of their power of appointment.

b. Proof of insurances with the specific coverage and limits required in Article V of the Agreement. Acceptable documents are:

i. Proof of NYS Worker's Compensation is only accepted on the C-105.2 or U-26.3 form.

ii. Proof of Disability insurance is only accepted on the DB-120.1 form.

Use the link below for a description of the required forms for Workers Compensation

and Disability:

http://www.osc.state.ny.us/agencies/guide/MyWebHelp/Content/XI/18/G.htm

iii. All other proof of insurance must be on the appropriate Certificate of Liability Insurance Acord form, as well as the Acord 855, or other form acceptable to the Fund.

c. The 120-day Schedule required by the General Requirements, Special Conditions paragraph 01 32 16, titled "Project Schedule."

Section 11 Requirements and Procedures for Participation by New York State -Certified Minority and Women -Owned Business Enterprises and Equal Employment Opportunities for Minority Group Members and Women

(1) New York State Law

Pursuant to New York State Executive Law Article 15-A and Parts 140-145 of Title 5 of the New York Codes, Rules and Regulations, the Fund is required to promote opportunities for the maximum feasible participation of New York State-certified Minority and Women-owned Business Enterprises ("MWBEs") and the employment of minority group members and women in the performance of the Fund contracts.

(2) Business Participation Opportunities for MWBEs

a. For purposes of this solicitation, the Fund hereby establishes goals (see Section 01 26 43 Amendments (Section E) of the General Requirements for goals) for New York State-certified Minority-owned Business Enterprise ("MBE") participation and for New York State-certified Women-owned Business Enterprise ("WBE") participation (based on the current availability of MBEs and WBEs). A contractor ("Contractor") on any contract resulting from this procurement ("Contract") must document its good faith efforts to provide meaningful participation by MWBEs as subcontractors and suppliers in the performance of the Contract. To that end, by submitting a bid, the bidder agrees that the Fund may withhold payment pursuant to any Contract awarded as a result of this bid pending receipt of the required MWBE documentation. A directory of MWBEs can be viewed at: https://ny.newnycontracts.com. For guidance on how the Fund will evaluate a Contractor's "good faith efforts," refer to 5 NYCRR § 142.8 and Article VI, Section 6.03(2)d of the Agreement.
b. The bidder understands that only sums paid to MWBEs for the performance of a commercially useful function, as that term is defined in 5 NYCRR § 140.1, may be applied towards the achievement of the applicable MWBE participation goal. The portion of a contract with an MWBE serving as a supplier that shall be deemed to represent the commercially useful function performed by the MWBE shall be 60 percent of the total value of the contract. The portion of a contract with an MWBE serving as a broker that shall be deemed to represent the commercially useful function performed by the MWBE shall be the monetary value for fees, or the markup percentage, charged by the MWBE.
c. In accordance with 5 NYCRR § 142.13, the bidder further acknowledges that if it is found to have willfully and intentionally failed to comply with the MWBE participation goals set forth in a Contract resulting from this RFP, such finding constitutes a breach of contract and the Fund may withhold payment as liquidated damages.

d. Such liquidated damages shall be calculated as an amount equaling the difference between: (1) all sums identified for payment to MWBEs had the Contractor achieved the contractual MWBE goals; and (2) all sums actually paid to MWBEs for work performed or materials supplied under the Contract.
e. By submitting a bid or proposal, a bidder agrees to demonstrate its good faith efforts to achieve the applicable MWBE participation goals by submitting evidence thereof in a format prescribed by the Fund.
f. Additionally, a bidder will be required to submit the following information as evidence of compliance with the foregoing:

    i. An MWBE Utilization Plan in accordance with paragraph (3) of the above Section 8 Submission of Post Bid Information. Any modifications or changes to an accepted MWBE Utilization Plan after the Contract award and during the term of the Contract must be revised via the online Utilization Plan application and submitted to the Fund for review and approval. Business Partners can modify their Utilization Plans by visiting the Fund's website and following the instructions for the online Utilization Plan application.
    ii. The Fund will review the submitted MWBE Utilization Plan and advise the bidder of the Fund's acceptance or issue a notice of deficiency within 20 calendar days of receipt.
    iii. If a notice of deficiency is issued, the bidder will be required to respond to the notice of deficiency within seven (7) business days of receipt by submitting to the Fund a written remedy in response to the notice of deficiency. If the written remedy that is submitted is not timely or is found by the Fund to be inadequate, the Fund shall notify the bidder within five (5) business days and direct them accordingly. Failure to cooperate with the Fund in a timely manner may be grounds for disqualification of the bid or proposal.

g. The Fund may disqualify a bidder as being non-responsive under the following circumstances:

    i. If a bidder fails to submit an MWBE Utilization Plan;
    ii. If a bidder fails to submit a written remedy to a notice of deficiency;
    iii. If a bidder fails to cooperate with the Fund; or
    iv. If the Fund determines that the bidder has failed to document good faith efforts.

h. The successful bidder will be required to attempt to utilize, in good faith, any MBE or WBE identified within its MWBE Utilization Plan, during the performance of the Contract. Requests for a partial or total waiver of established goal requirements made subsequent to Contract Award may be made at any time during the term of the Contract to the Fund, but must be made no later than prior to the submission of a request for final payment on the Contract.
i. Over the term of the Contract, the successful bidder will be required to submit to the Fund a monthly MWBE Contractor Compliance & Payment Reporting in the electronic format prescribed by the Fund, documenting the progress made toward achievement of the MWBE goals of the Contract.

(3) Equal Employment Opportunity Requirements

a. By submission of a bid in response to this solicitation, the bidder agrees with all of the terms and conditions of Schedule "A" - Provisions Required to Be Inserted by Law, including Clause 11 - Equal Employment Opportunities for Minorities and Women. The bidder is required to ensure that it and any subcontractors awarded a subcontract for the construction, demolition,

replacement, major repair, renovation, planning or design of real property and improvements thereon (the "Work"), except where the Work is for the beneficial use of the bidder, undertake or continue programs to ensure that minority group members and women are afforded equal employment opportunities without discrimination because of race, creed, color, national origin, sex, age, disability or marital status. For these purposes, equal opportunity shall apply in the areas of recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff, termination, and rates of pay or other forms of compensation. This requirement does not apply to: (i) work, goods, or services unrelated to the Contract; or (ii) employment outside New York State.

b. The bidder will be required to submit an Equal Employment Opportunity Policy Statement in accordance with paragraph (4) of the above Section 8 Submission of Post Bid Information.
c. If awarded a Contract, bidder shall submit a Monthly Employment Utilization Report and shall require each of its subcontractors to submit a Monthly Employment Utilization Report in the electronic format prescribed by the Fund during the term of the Contract.
d. Further, pursuant to Article 15 of the Executive Law (the “Human Rights Law”) and all other State and Federal statutory and constitutional non-discrimination provisions, the Contractor and sub-contractors will not discriminate against any employee or applicant for employment because of race, creed (religion), color, sex, national origin, sexual orientation, gender identity or expression, military status, age, disability, predisposing genetic characteristic, marital status or domestic violence victim status, and shall also follow the requirements of the Human Rights Law with regard to non-discrimination on the basis of prior criminal conviction and prior arrest.

(4) Reports, Records and Documentation

a. The Contractor shall file with the Fund monthly reports in the electronic form prescribed by the Fund regarding actions taken pursuant to this Section as well as a list of and value of subcontracts and supply contracts.
b. The Contractor shall permit access to its books, records and accounts by the Fund for purposes of investigation to ascertain compliance with the provisions of this Section. The Contractor shall include this provision in every subcontract so that such provision will be binding upon each subcontractor.
c. Failure to comply with the foregoing requirements entitles the Fund to take such action as the withholding of funds, suspension or termination of the Contract or such other actions or enforcement proceedings as allowed by the Contract. Such failure may also result in a finding of non-responsiveness, non-responsibility and/or a breach of the Contract.
a.

Section 12 Requirements and Procedures for Participation by New York State Certified Service-Disabled Veteran-Owned Business Enterprises (“SDVOBs”)

(1) New York State Law

Pursuant to New York State Veterans’ Service Law Article 3 and Parts 252.2 of Title 9 of the New York Codes, Rules and Regulations, the Fund is required to promote opportunities for the participation of New York State-certified Service-Disabled Veteran-Owned Business Enterprises in the performance of the Fund contracts to ensure progress toward the statewide SDVOB Utilization goal of 6% established by Article 3 of the New York State Veterans’ Services Law.

a. New York State Veterans' Services Law Article 3 acknowledges that SDVOBs strongly contribute to the economies of the State and the nation. As defenders of our nation and in recognition of their economic activity in doing business in New York State, bidders are strongly encouraged and expected to consider SDVOBs in the fulfillment of the requirements of the project. Such partnering may be as subcontractors, subconsultants, suppliers, protégés or other supporting roles. SDVOBs can be readily identified on the directory of certified businesses at https://sdves.ogs.ny.gov/business-search

b. Bidders are strongly encouraged to the maximum extent practical and consistent with legal requirements of the State Finance Law and the Executive Law, to use responsible and responsive SDVOBs as subcontractors to provide meaningful participation. Furthermore, bidders are reminded that they must continue to also utilize small, minority and women-owned businesses consistent with Article 15-A of Executive Law. Utilizing SDVOBs in State contracts will help create more private sector jobs, rebuild New York State's infrastructure, and maximize economic activity to the mutual benefit of the bidder and its SDVOB partners. SDVOBs will promote the bidder's optimal performance under any potential agreements, thereby fully benefiting the public sector programs that are supported by associated public procurements.

c. Public procurements can drive and improve the State's economic engine through promotion of the use of SDVOBs by its bidders. The State, therefore, expects bidders to provide maximum assistance to SDVOBs in the performance of any potential agreement. The potential participation by all kinds of SDVOBs will deliver great value to the State and its taxpayers.

(2) Business Participation Opportunities for SDVOBs

a. For purposes of this solicitation, the Fund hereby establishes goals (see Section 01 26 43 Amendments (Section E) of the General Requirements for goals) for New York State-certified Service-Disabled Veteran-Owned Businesses (SDVOB) (based on the current availability of SDVOBs).

A contractor ("Contractor") on any contract resulting from this procurement ("Contract") must document its good faith efforts to provide meaningful participation by SDVOBs as subcontractors and suppliers in the performance of the Contract. To that end, by submitting a bid, the bidder agrees that the Fund may withhold payment pursuant to any Contract awarded as a result of this bid pending receipt of the required SDVOB documentation. A directory of SDVOBs can be viewed at: https://sdves.ogs.ny.gov/business-search. For guidance on how the Fund will evaluate a Contractor's "good faith efforts," refer to 9 NYCRR § 252.2 and Article IX, of the Agreement.

b. The bidder understands that only sums paid to SDVOBs for the performance of a commercially useful function, as that term is defined in 9 NYCRR § 252.2, may be applied towards the achievement of the applicable SDVOB participation goal. The portion of a contract with an SDVOB serving as a supplier that shall be deemed to represent the commercially useful function performed by the SDVOB shall be 100 percent of the total value of the contract.

c. In accordance with 9 NYCRR § 252.2 (s), the bidder further acknowledges that if it is found to have willfully and intentionally failed to comply with the SDVOB participation goals set

forth in a Contract resulting from this RFP, such finding constitutes a breach of contract, and the Fund may withhold payment as liquidated damages.

d. Any contractor who willfully and intentionally fails to comply with the service-disabled veteran owned business participation requirements in accordance with 9 NYCRR § 252.2 (s) as set forth in such State contract shall be liable to the contracting agency for damages as otherwise specified in the contract and shall provide for other appropriate remedies on account of such breach. Damages shall be calculated based on the actual cost incurred by the State agency related to the State agency's expenses for personnel, supplies and overhead related to establishing, monitoring, and reviewing certified service-disabled veteran-owned business enterprise programmatic goals.

e. By submitting a bid or proposal, a bidder agrees to demonstrate its good faith efforts to achieve the applicable SDVOB participation goals by submitting evidence thereof in a format prescribed by the Fund.

f. Additionally, a bidder will be required to submit the following information as evidence of compliance with the foregoing:

   i. An SDVOB Utilization Plan in accordance with paragraph (2) of the above Section 8 Submission of Post Bid Information. Any modifications or changes to an accepted SDVOB Utilization Plan after the Contract award and during the term of the Contract must be submitted via the online Utilization Plan application and submitted to the Fund for review and approval. Business Partners can modify their Utilization Plans by visiting the Fund's website and following the instructions for the online Utilization Plan application.

   ii. The Fund will review the submitted SDVOB Utilization Plan and advise the bidder of the Fund's acceptance or issue a notice of deficiency within 20 calendar days of receipt.

   iii. If a notice of deficiency is issued, the bidder will be required to respond to the notice of deficiency within seven (7) business days of its receipt by submitting to the Fund a written remedy in response to the notice of deficiency. If the written remedy that is submitted is not timely or is found by the Fund to be inadequate, such a failure to remedy the deficiency may be grounds for disqualification of the bid or proposal for non-responsiveness or the Fund may notify the bidder and request the bidder submit a waiver form within five (5) business days.

g. The Fund may disqualify a bidder as being non-responsive under the following circumstances:

   i. If a bidder fails to submit an acceptable SDVOB Utilization Plan;
   ii. If a bidder fails to submit a timely written remedy to a notice of deficiency;
   iii. If the Fund determines the bidder's written remedy to a notice of deficiency is inadequate;
   iv. If a bidder fails to file a waiver form in a timely manner;

h. A bidder is further subject to disqualification if:

a. The bidder fails to cooperate with the Fund; or
b. If the Fund determines that the bidder has failed to document its good faith efforts.

i. The successful bidder will be required to attempt to utilize, in good faith, any SDVOB identified within its SDVOB Utilization Plan, during the performance of the Contract. Requests for a partial or total waiver of established goal requirements made subsequent to Contract Award may be made at any time during the term of the Contract to the Fund but must be made no later than prior to the submission of a request for final payment on the Contract.

j. Over the term of the Contract, the successful bidder will be required to submit to the Fund a monthly SDVOB Contractor Compliance & Payment Reporting in the electronic format prescribed by the Fund, documenting the progress made toward achievement of the SDVOB goals of the Contract.

Section 13 Encouraging Use of New York State Business Businesses in Contract Performance

New York State businesses have a substantial presence in State contracts and strongly contribute to the economies of the State and the nation. In recognition of their economic activity and leadership in doing business in New York State, bidders/proposers for this contract for commodities, services or technology are strongly encouraged and expected to consider New York State businesses in the fulfillment of the requirements of the contract. Such partnering may be as subcontractors, suppliers, protégés or other supporting roles.

Bidders/proposers need to be aware that all authorized users of this contract will be strongly encouraged, to the maximum extent practical and consistent with legal requirements, to use responsible and responsive New York State businesses in purchasing commodities that are of equal quality and functionality and in utilizing services and technology. Furthermore, bidders/proposers are reminded that they must continue to utilize small, minority and women-owned businesses, consistent with current State law.

Utilizing New York State businesses in State contracts will help create more private sector jobs, rebuild New York's infrastructure, and maximize economic activity to the mutual benefit of the Contractor and its New York State business partners. New York State businesses will promote the Contractor's optimal performance under the contract, thereby fully benefiting the public sector programs that are supported by associated procurements.

Public procurements can drive and improve the State's economic engine through promotion of the use of New York businesses by its Contractors. The State therefore expects bidders/proposers to provide maximum assistance to New York businesses in their use of the contract. The potential participation by all kinds of New York businesses will deliver great value to the State and its taxpayers.

Information on the availability of New York State subcontractors and suppliers is available from: New York State Department of Economic Development, Procurement Assistance Unit, One Commerce Plaza, Albany, New York 12245, Phone: (518) 474-7756, Fax: (518) 486-7577.

Section 14 Single Contract Responsibility

This is a single bid general construction project. The Contractor submitting the bid is responsible for all work associated with this Project.

Section 15 Examination of Site

A pre-bid conference and project walk-through will be held with all bidders, subcontractors and other plan holders at the time and place specified in Section 00 25 13 Pre-Bid Meetings. No individual or additional walk-throughs will be provided. Failure to attend a walk-through shall not be the cause for extra payment. If the walk-through in Section 00 25 13 Pre-Bid Meetings is mandatory, the Fund expressly reserves the right to reject any Proposal as not responsive if the bidder failed to attend the mandatory walk-through.

Section 16 Procurement Lobbying Law Restrictions

Please be advised that State Finance Law Sections 139-j and 139-k include and impose certain restrictions on communications between the Fund and bidders during the procurement process. A bidder is restricted from making contacts from the earliest notice of intent to solicit offers through receipt of the Notice to Proceed ("restricted period") to other than designated staff, unless it is a contact that is included among certain statutory exceptions set forth in State Finance Law Sections 139-j(3)(a). Designated staff is identified in the Notice to Bidders as of the date hereof. Fund employees are also required to obtain certain information when contacted during the restricted period and make a determination of the responsibility of the bidder pursuant to these two statutes. Certain findings of non-responsibility can result in rejection for contract award and in the event of two findings within a 4-year period, the Offeror/bidder is debarred from obtaining governmental procurement contracts.

Bidders must also disclose whether any governmental entity has made a finding of non-responsibility within the previous four years based upon the failure to comply with Section 139-j of the State Finance Law or intentionally providing false or incomplete information to a governmental entity. The Form for this disclosure is on the last page of the Proposal and the bidder must fill out and sign this Form.

Further information about these requirements can be found on the State Office of General Services website (https://ogs.ny.gov/ACPL/) and the Fund website (https://sucf.suny.edu/opportunities/procurement-lobbying-act-policy-and-procedures).

Section 17 Requirements for Construction Activities To Address Public Health or Safety

The bidder agrees it is responsible for complying with any and all health and safety requirements issued by federal, state or local entities, including but not limited to New York State Governor Office Executive Orders, New York State Department of Health rules, regulations and guidance, and other New York State, Fund or Campus laws, rules, regulations or requirements that exist or may be issued and/or amended during the bidding and/or performance of work on this Project. Bidder affirms that all costs and time associated with compliance of these health and safety requirements, including Emergency Regulations, are included in its bid. The current NYS Emergency Regulations and Guidance are available at the following website:

https://regs.health.ny.gov/regulations/emergency

Notwithstanding the foregoing, bidder agrees to comply with the Emergency Regulations, Guidance, and Campus Rules and Regulations as it may be amended or superseded in the future.

Bidder shall comply with Section 2.03 of the Contract regarding any claims or disputes stemming from such health and safety requirements.

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State University Construction Fund

MWBE/SDVOB
UTILIZATION PLAN INSTRUCTIONS

MWBE and SDVOB Utilization Plans are required to be submitted electronically via the Fund's online Utilization Plan Application, by the three low bidders **within seven (7) calendar days** after the bid opening. Submission of a Utilization Plan which fails to at least meet each goal must be accompanied by documentation of specific efforts undertaken both pre and post bid. The Contractor is required to provide sufficient documentation of the efforts made in the development of their MWBE and SDVOB Plans. The documentation should be responsive to the "Good Faith Efforts" guidelines and demonstrate the contractor's commitment to providing opportunities for MWBE and SDVOB firms in the development of each respective Utilization Plan.

The Fund will review the MWBE and SDVOB Utilization Plans and notify the contractor of any deficiencies and determine necessary actions to bring the Plan into compliance. The firms listed on the Utilization Plan will be contacted for verification of participation. A copy of the approved Plan is provided to the contractor after issuance of the Fund's Notice of Award. **Be advised, the Fund does not issue its Notice of Award without an approved MWBE Utilization Plan, and the Construction Contract may be withheld.**

ONLINE UTILIZATION PLAN If you are one of the lowest three bidders and have not received an email within 24 hours, please contact SUCF.ConstructionBids@suny.edu	Following the project bid opening, the Fund will forward the three lowest bidders an email containing instructions for submitting their MWBE and SDVOB Utilization Plan. The email will provide each firm with a link to complete their Plans electronically via the Fund's online Utilization Plan application. Utilization Plans are accepted in the ONLINE FORMAT ONLY; any other form submittal will be rejected.
CONTRACT INFORMATION	▪ The contract information will appear at the top of the application screen. (Project Number, Contract Number, Bid Date, Contract Award Value, MWBE/SDVOB Contract Goals)
BUSINESS PARTNER INFORMATION **MWBE/SDVOB CONTACT**	▪ Verify the accuracy of your Company Name, Company Address and FEIN populated by the application. ▪ Enter the Contact Name, Contact Title, Phone, Fax, Email Address of the person responsible for MWBE/SDVOB participation with your organization.
SUBCONTRACTOR/SUPPLIER INFORMATION **BE ADVISED: Only firms holding "current" New York State certification status are acceptable for participation credit.**	▪ Enter a valid Federal Identification number for each MBE, WBE, and SDVOB subcontractor and supplier. ▪ The NYS certified MBE/WBE/SDVOB firm matching the Federal ID number provided will autofill in the application. ▪ Verify the subcontractor/supplier information for accuracy. **MWBE firms must be certified by the New York State Department of Economic Development Corporation** as a Minority or Women-Owned Business to comply with the program requirements. It is the responsibility of the contractor to ensure firms proposed for utilization have an active certification with NYS and are included in the directory at the time of submission. The NYS directory of certified MWBE firms is available on the Internet at https://ny.newnycontracts.com/ NOTE: Dual certified firms may be used as either, but not both, within their certification product code. **SDVOB firms must be certified by the Office of General Services, Division of Service-Disabled Veterans' Business Development** as a Service-Disabled Veteran-owned Business to comply with the program requirements. It is the responsibility of the contractor to ensure firms proposed for utilization have an active certification with NYS and are included in the directory at the time of submission. The NYS directory of certified Service-Disabled Veteran-Owned Businesses is available on the Internet at https://sdves.ogs.ny.gov/

SUNY State University Construction Fund

MWBE/SDVOB
UTILIZATION PLAN INSTRUCTIONS

SUBCONTRACTOR/SUPPLIER INFORMATION	▪ If the participation is not direct from the Prime/General Contractor, Enter the 1st or 2nd tier subcontractor's name and email address. **The prime contractor is responsible for ensuring participation included in the Plan by subcontractors/suppliers is executed.**
DESCRIPTION OF WORK **The services MWBE and SDVOB firms provide must be among those explicitly identified in the firm's profile (codes) as listed in the NYS MWBE and SDVOB Directory.** **Firms who participate in the project outside of these conditions <u>will</u> <u>not</u> be credited toward the MWBE and/or SDVOB Utilization Plan and goals for the contract.**	▪ Provide a specific but brief description of work to be performed or supplies to be purchased from the MBE, WBE, SDVOB subcontractor or supplier. ▪ Select the firm designation: Subcontractor, Supplier, or Broker The following credit will be applied for MWBE subcontractors/suppliers. ▪ Construction Subcontractor – 100% ▪ Construction Supplier (MWBE) – 60% Firms that sell goods out of their revolving inventory. **Enter the full contract value. The system will calculate 60% credit.** ▪ Construction Supplier (SDVOB) – 100% ▪ Brokers/Construction Manufacturers' Representatives – Firms serving as a third-party intermediary between consumers of items and manufacturers, suppliers, or other entities, may only receive credit for the commission they receive or their markup percentage for brokering. ▪ MWBE Manufacturers: NYS-certified MWBEs that serve and are coded as a manufacturer may receive 100% credit for their MWBE utilization.
SUBCONTRACTOR/SUPPLIER SCHEDULE	▪ Enter the anticipated start and completion dates for each MBE, WBE, and SDVOB subcontractor and/or supplier. ▪ **Enter the dates in accordance with the scope and project scheduling.**
ATTACHMENTS	▪ Upload supporting documentation i.e., letter of explanation, good faith efforts documentation. ▪ Upload signed MWBE and SDVOB Utilization Plans (original signature) ▪ After attaching documents return to the submit tab to finalize.
FINAL REVIEW	▪ Review all information prior to submitting. ▪ Select SAVE if you wish to continue working on the Plan prior to submission. ▪ To modify the Initial Plan <u>prior to final submission</u>, select the link provided in the original email from the Fund and choose "re-submit" for the option to edit the initial Utilization Plan.
SIGNATURE/SUBMIT ***An original signature is required on the Utilization Plan.**	▪ Provide the Name, Title, Email address and Signature of a Company Officer. ▪ Choose "Create Utilization PDF" ▪ Print and Sign MWBE and SDVOB Utilization Plans ▪ Upload the Plans into the "Attachments" section of the application. ▪ Select SUBMIT to forward for approval.
UTILIZATION PLAN MODIFICATION **Prior approval must be obtained from the Fund for decrease in participation or deletion of a firm. A letter of explanation and supporting documentation of efforts is required to be submitted to the Fund. Upload supporting documentation via the attachments tab.**	▪ To modify the Initial Plan prior to final submittal, select the link provided in the original email from the FUND and choose "re-submit" for the option to edit the Utilization Plan. ▪ To modify an existing Plan, return to the Business Partner Application ➢ **ADD** – choose "add subcontractor" on the bottom of the subcontractor/supplier tab for firms that you are adding to the plan. Click the disc icon to save. ➢ **DELETE** – To remove firms from the approved Plan, locate the name of the firm, Click the icon to save, **an explanation is required.** ➢ **PLAN VALUE UPDATE-** Click the icon next to the appropriate subcontractor and/or supplier and enter the dollar amount of the increase/decrease of the award value. Click the icon to save, **an explanation is required.** ➢ **SCHEDULE UPDATE** – Click the icon next to the appropriate subcontractor and/or supplier to change the anticipated start and completion dates for each firm. Click the disc icon to save.

For questions and/or assistance contact the Opportunities Program office. Phone: 518-320-1650 | Email: sucf.opportunityadmin@suny.edu

SECTION 00 25 13 - PRE-BID MEETINGS

A pre-bid conference and project walk-through will be held on **(09/16/26)** with all Bidders

assembled at @ SUNY New Paltz Peregrine Dining Hall. No individual or additional walk-throughs may be

performed during the bid preparation time period. Vehicle parking must comply with campus regulations. Failure to attend a walk-through shall not be the cause for extra payment.

Prior to the Pre-Bid Meeting, SUNY New Paltz is required to notify the occupants of Peregrine Dining Hall Bldg. No. 032 of the scheduled Pre-Bid meeting and its location. Notification shall be provided no less than 48 hours prior to the meeting.

Attached is a copy of the campus parking map for contractors and design team. Daily parking tickets can be purchased for $3.00.

The pre-bid meeting shall be chaired by the Consultant with the following as the minimum agenda (Hold questions on scope until item 5 below):

1. Confirm that bidders have a full bid package including any addenda issued to date.

   Please be advised of new standard documents:

   a. For projects advertised for bidding after July 1, 2023,

      1) See revised 00 21 13 20 Information for Bidders dated June 2023 and review in its entirety.

      2) See new Agreement Sections 5.06 Insurance and 5.07 Builder's Risk, and new Schedule A, and review the insurance changes in their entirety.

   b. See Section 01 74 19 Construction Waste Management has been added at the request of the SUNY Sustainability Coalition. Please review the section and consider how to meet its goal for recycling at least 50% of the construction and demolition waste generated by this contract.

   c. See Section 11 of 00 21 13 20 Information for Bidders for participation by MBEs and WBEs. The MBE/WBE participation goals for this project are:

      - _18%_ percent for MBE participation
      - _12%_ percent for WBE participation

   d. See Section 12 of the Information for Bidders for participation by Service-Disabled Veteran-Owned Businesses. The SDVOB goal for this project is _6_%

   e. Utilization Plans shall be accepted in the ONLINE FORMAT ONLY using the Fund's web-based application; any other form of submittal will be rejected. Low bidders will receive an email with access instructions after receipt of bids. Questions must be sent to SUCF.OpportunityAdmin@suny.edu

2. Review the timetable for submitting questions and issuing addenda.

3. Confirm the bid date and time.

To provide for an efficient bid opening, do not submit additional documents other than two Proposals and two bid bonds in your bid envelope.

4. Advise bidders that no changes to the Contract Documents are binding unless included in an addendum. Verbal comments are not binding.

5. Review the project scope and schedule. Describe the main concepts of the project.

   a. Review the list of sole/single source products listed in General Requirements Section 01 26 43 Amendments (if any) and remind bidders that all costs for these products are covered by the base bid and no equivalents will be permitted.

   b. Remind bidders and potential subs that each must have experience performing scope similar to this project scope. Review the specific Qualifications for Bidders and the nominated subcontractors as written in the Information for Bidders with the attendees.

6. Describe and discuss any Campus restrictions regarding security, access, worker prerequisites for entry to Campus, parking, and/or other restrictions that create cost and time difficulties related to this project.

7. Other items:

   a. Refer the bidders to the 00 21 13 15 Contractors Bid and Post Bid Checklist.

   b. Note that for projects advertised for bids after July 1, 2023, insurance requirements have changed. Key points for bidders are:

   - All required insurance shall be written by companies that are licensed or authorized by the New York State Department of Financial Services to issue insurance in the State of New York and that have an A.M. Best Company rating of “A-,” Class “VII” or better;
   - Insurances from authorized (excess line) carriers may be acceptable. Bidders must review the project specific insurance listed in Section 5.06, **Section 5.07** and Schedule A of the Construction Agreement with their agent/broker; and
   - Owner’s Protective Liability Insurance is no longer required from contractors.

   For projects with bid openings on or after July 14, 2024, **Builder’s Risk Insurance will <u>no longer</u> be provided by the Fund under a master builders risk program and shall be at the cost of the Contractor.**

   Bidders and Asbestos subs must consult their insurance company/agent prior to bidding.

   c. If the Fund issues a Notice of Award and the bidder doesn’t provide acceptable insurance, then the Fund may rescind the award and take other actions to which it is entitled. All resulting costs and time delay are solely the responsibility of the bidder.

   d. Note the dollar threshold for named subcontractors back is $20,000 except for asbestos subs of any value, who must be named.

9. Have a question-and-answer session.

10. Tour the site and existing conditions.

LOT DESIGNATIONS

RESIDENT
(† additional overnight parking)

Bouton Hall Parking
Ashokan Hall Parking
Esopus Hall Parking
Lenape Hall Resident Parking
Route 32 South Resident Parking #28A†
South Parking

FACULTY/STAFF ONLY

Administration Parking
Center Parking
Children's Center Parking
Elting Parking
Elting Staff Parking
Peregrine Parking
International Programs Parking
Lecture Center Parking
Library Parking
Old Main Circle Parking *Handicap only*
Old Main Parking
Parker Theatre Parking *Handicap only*
Pond Road Parking
Service Building Parking
Shango Parking
South Classroom Parking
South Faculty Building Parking
Staff Parking
Terrace Parking
University Police Parking

COMMUTER ONLY

Elting Lower Parking
Elting Main Parking
Elting Middle Parking
Wallkill Parking
West Parking

COMMUTER AND FACULTY/STAFF
(*overnight parking)

Route 32 Parking *
Lenape Hall Parking

OVERNIGHT PARKING FOR VISITORS, COMMUTER, AND FACULTY/STAFF
(*Permited in these lots only)

Route 32 Parking *
Wallkill Parking *

VISITOR PARKING
(Daily pass required)

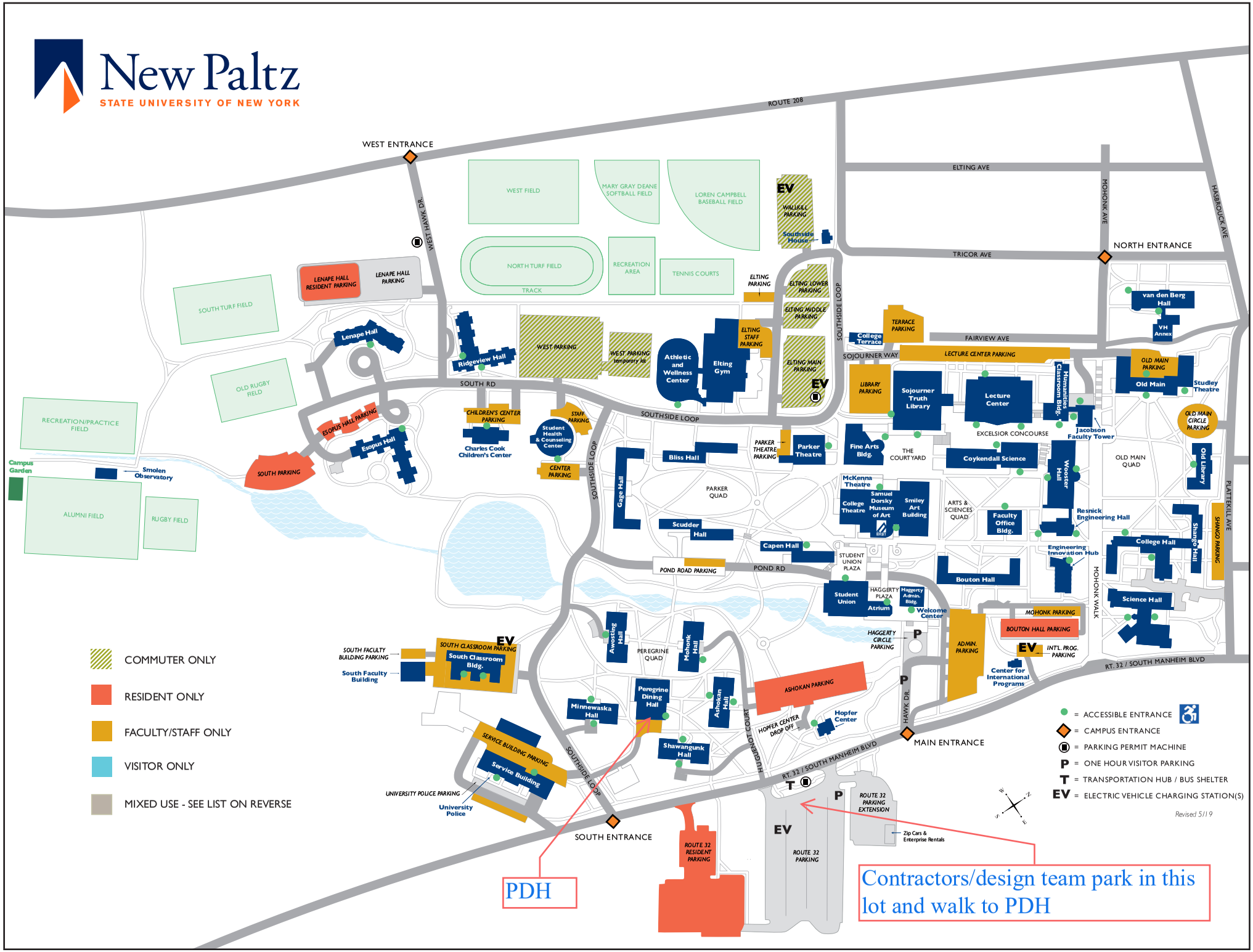
Visitor permits allow visitors to park in any lot on campus ***EXCEPT*** for resident student lots.

VISTOR PARK & PAY MACHINES

Elting Main Parking
Route 32 Parking
West Hawk Drive

RESERVED SPACES

By special permit only


New Paltz
STATE UNIVERSITY OF NEW YORK
ROUTE 208
WEST ENTRANCE
NORTH ENTRANCE
MAIN ENTRANCE
SOUTH ENTRANCE
ELTING AVE
TRICOR AVE
FAIRVIEW AVE
SOJOURNER WAY
SOUTH RD
SOUTHSIDE LOOP
POND RD
WEST HAWK DR.
MOHONK AVE
HASBROUCK AVE
PLATTEKILL AVE
MOHONK WALK
HAWK DR.
HUGUENOT COURT
RT. 32 / SOUTH MANHEIM BLVD
WEST FIELD
MARY GRAY DEANE SOFTBALL FIELD
LOREN CAMPBELL BASEBALL FIELD
NORTH TURF FIELD
TRACK
RECREATION AREA
TENNIS COURTS
SOUTH TURF FIELD
OLD RUGBY FIELD
RECREATION/PRACTICE FIELD
ALUMNI FIELD
RUGBY FIELD
Campus Garden
Smolen Observatory
LENAPE HALL RESIDENT PARKING
LENAPE HALL PARKING
Lenape Hall
Ridgeview Hall
WEST PARKING
WEST PARKING temporary lot
Athletic and Wellness Center
Elting Gym
ELTING PARKING
ELTING STAFF PARKING
ELTING LOWER PARKING
ELTING MIDDLE PARKING
ELTING MAIN PARKING
WALLKILL PARKING
Southside House
ESOPUS HALL PARKING
Esopus Hall
SOUTH PARKING
CHILDREN'S CENTER PARKING
Charles Cook Children's Center
STAFF PARKING
Student Health & Counseling Center
CENTER PARKING
Bliss Hall
PARKER THEATRE PARKING
Parker Theatre
Gage Hall
PARKER QUAD
Scudder Hall
Capen Hall
POND ROAD PARKING
STUDENT UNION PLAZA
College Terrace
TERRACE PARKING
LECTURE CENTER PARKING
LIBRARY PARKING
Sojourner Truth Library
Lecture Center
Humanities Classroom Bldg.
Jacobson Faculty Tower
EXCELSIOR CONCOURSE
Fine Arts Bldg.
THE COURTYARD
Coykendall Science
Wooster Hall
McKenna Theatre
College Theatre
Samuel Dorsky Museum of Art
Smiley Art Building
ARTS & SCIENCES QUAD
Faculty Office Bldg.
Resnick Engineering Hall
Engineering Innovation Hub
Bouton Hall
Student Union
HAGGERTY PLAZA
Atrium
Haggerty Admin. Bldg.
Welcome Center
HAGGERTY CIRCLE PARKING
ADMIN. PARKING
MOHONK PARKING
BOUTON HALL PARKING
INT'L. PROG. PARKING
Center for International Programs
van den Berg Hall
VH Annex
OLD MAIN PARKING
Old Main
Studley Theatre
OLD MAIN CIRCLE PARKING
OLD MAIN QUAD
Old Library
Shango Hall
SHANGO PARKING
College Hall
Science Hall
Awosting Hall
PEREGRINE QUAD
Mohonk Hall
Peregrine Dining Hall
Ashokan Hall
ASHOKAN PARKING
HOPFER CENTER DROP OFF
Hopfer Center
Minnewaska Hall
Shawangunk Hall
SOUTH CLASSROOM PARKING
South Classroom Bldg.
SOUTH FACULTY BUILDING PARKING
South Faculty Building
SERVICE BUILDING PARKING
Service Building
UNIVERSITY POLICE PARKING
University Police
ROUTE 32 RESIDENT PARKING
ROUTE 32 PARKING
ROUTE 32 PARKING EXTENSION
Zip Cars & Enterprise Rentals
COMMUTER ONLY
RESIDENT ONLY
FACULTY/STAFF ONLY
VISITOR ONLY
MIXED USE - SEE LIST ON REVERSE
= ACCESSIBLE ENTRANCE
= CAMPUS ENTRANCE
= PARKING PERMIT MACHINE
P = ONE HOUR VISITOR PARKING
T = TRANSPORTATION HUB / BUS SHELTER
EV = ELECTRIC VEHICLE CHARGING STATION(S)
Revised 5/1/9
PDH
Contractors/design team park in this lot and walk to PDH

_____
NAME OF BIDDER

_____
ADDRESS OF BIDDER

00 42 13 **PROPOSAL FOR SUCF PROJECT NO. 081056-00**

Renovate Peregrine Dining Hall, Bldg. No. 032

SUNY New Paltz

TO THE STATE UNIVERSITY CONSTRUCTION FUND:

1. The Bidder agrees that it shall complete all work necessary for substantial completion within 900calendar days from receipt of the Notice to Proceed.

   In the event the bidder fails to complete such work by said date, or within the time to which such completion may have been extended in accordance with the Contract Documents, the bidder agrees to pay the Fund liquidated damages in the sum of $4,400.00 for each calendar day of delay in completing the work.

2. The bidder hereby declares that it has carefully examined all Bidding and Contract Documents and that it has inspected the actual location of the work, together with the local sources of supply, has satisfied itself as to all the quantities and conditions, and understands that in signing this Proposal, it waives all right to plead any misunderstanding regarding the same.

3. The bidder further understands and agrees that it is to do, perform and complete all work in accordance with the Contract Documents and to accept in full compensation therefor the amount of the TOTAL BID, modified by such additive or deductive alternates, if any, as are accepted by the Fund.

4. The bidder further agrees to accept the unit prices, if any, set forth in paragraph (5) hereof, except as the same may be modified pursuant to the provisions of Section 5 of the Information to Bidders, as full payment for any deletions, additions, modifications or changes to the portion or portions of work covered by said unit prices.

5. a. **BID CALCULATION:**

   (1) All work including Allowances (if any) listed in 5.d. below and excluding Field Order Allowance

   _____

   _____ $ _____
   (In words) (In figures)

   (2) Field Order Allowance: Schedule III and Section 4.05A of the Agreement

   One Million, six hundred and thirty-eight thousand, six hundred and fifty dollars__

   _____ $ 1,638,650_____
   (In words) (In figures)

   (3) TOTAL BID Add lines (1) and (2)

   _____

   _____ $ _____
   (In words) (In figures)

b. **ALTERNATES**: Refer to 01 23 00 Alternates (Section B) of the General Requirements. The bidder proposes the following Additions to or Deductions from the TOTAL BID for the alternatives listed below:

Alternate Number	Add/ Deduct	Amount In Words	Amount In Figures
		NONE	

c. **UNIT PRICES**: The bidder or the Fund may insert unit prices for the work or materials listed below. Refer to Section 5, paragraph (2) of the Information to Bidders, Schedule 1 and Article IV Section 4.04 of the Agreement for clarification. Such unit prices apply solely for additions. The Fund may, however, adjust any unit price filled in by a bidder to an amount agreeable to both the bidder and the Fund, or it may reject any unit price. The amount of any unit price accepted or agreed to by the Fund shall be reduced by 15 percent for any deduction in the work or materials covered by such unit price.

Work or Materials Description	Amount in Words	Amount in Figures
	NONE	

d. **ALLOWANCES:** The bidder further agrees that its TOTAL BID includes the Allowance(s) listed below. Refer to Schedule II and Sections 4.04 and 4.05 of the Agreement for clarification:

Work or Materials Description	Amount in Words	Amount in Figures
	NONE	

6. By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid, each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his or her knowledge and belief: (a) the prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or with any competitor; (b) unless otherwise required by law, the prices have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and (c) no attempt has been made or will be made by the bidder to induce any person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

   A bid shall not be considered for award nor shall any award be made where (a), (b) and (c) above have not been complied with; provided, however, that if in any case the bidder cannot make the foregoing certification the bidder shall so state and shall furnish with the bid a signed statement which sets forth in detail the reasons therefor. Where (a), (b), and (c) above shall have not been complied with, the bid shall not be considered for award nor shall any award be made unless the General Manager of the Fund, or his designee, determines that such disclosure was not made for purposes of restricting competition.

   The fact that a bidder (a) has published price lists, rates, or tariffs covering items being procured, (b) has informed prospective customers of proposed or pending publication of new or revised price lists for such items, or (c) has sold the same items to other customers at the same prices being bid, does not constitute, without more, a disclosure within the meaning of this Section.

7. The bidder agrees that if awarded the Contract, it will commence work upon receipt of the Notice to Proceed and that it will fully complete the work by the date stated or within the duration herein, as applicable.

8. The bidder acknowledges the receipt of the following addenda, but agrees that it is bound by all addenda whether or not listed herein.

Addendum Number	Date	Addendum Number	Date
_____	____/____/____	_____	____/____/____
_____	____/____/____	_____	____/____/____
_____	____/____/____	_____	____/____/____

9. The Omnibus Procurement Act of 1992, as amended, requires that, by signing this Proposal, the bidder certifies that whenever its Total Bid amount is greater than $1,000,000: (a) it has made reasonable efforts to encourage the participation of New York State Business Enterprises as suppliers and subcontractors on this Project, and has retained the documentation of these efforts to be provided upon request to the State; (b) it has complied with the Federal Equal Opportunity Act of 1972 (P.L. 92-261), as amended; (c) it agrees to make reasonable efforts to provide notification to New York State residents of employment opportunities on this Project through listing any such positions with Community Services Division of the New York State Department of Labor, or providing such notification in such manner as is consistent with existing collective bargaining contracts or agreements. The bidder further agrees to document these efforts and to provide said documentation to the State and the Fund upon request, and agrees to cooperate with the State in these efforts. Documented efforts by a successful bidder shall consist of and be limited to showing that such bidder has:

   a. Solicited bids, in a timely and adequate manner, from New York State Business Enterprises including certified Minority and Women's owned Business Enterprises, or

   b. Contacted the New York State Department of Economic Development to obtain listings of New York State Business Enterprises, or

   c. Placed notices for subcontractors and suppliers in newspapers, journals and other trade publications distributed in New York State, or

   d. Participated in bidder outreach conferences.

   e. If the bidder determines that New York State Business Enterprises are not available to participate on the Contract as subcontractors or suppliers, the bidder shall provide a statement indicating the method by which such determination was made.

   f. If the bidder does not intend to use subcontractors on the Contract, the bidder shall provide a statement verifying such intent.

10. The bidder submits herewith bid security in an amount not less than five (5) percent of the Total Bid. In the event that

    (a) the bidder's Total Bid is the lowest one submitted and the bidder does not timely provide the Post-Bid Information required under Section 8 of the Information for Bidders; or

    (b) this Proposal is accepted by the Fund and the bidder shall refuse or neglect, within ten (10) working days after date of receipt of Notice of Award to:

    (1) execute and deliver an Agreement in the form provided herein; or

    (2) execute and deliver a Performance Bond and a Labor and Material Bond in the amounts required and in the form prescribed; or

    (3) provide proof of insurances required in Article V of the Agreement; or

    (4) provide the 120-day Schedule required by the General Requirements, Special Conditions paragraph 01 32 16, titled "Project Schedule;"

then the bidder shall be liable to the Fund, as liquidated damages, for the amount of the bid security or the difference between the Total Bid of the bidder and the Total Bid of the bidder submitting the next lowest bid, whichever sum shall be higher, otherwise the total amount of the bid security will be returned to the bidder in accordance with the provisions set forth in the Information for Bidders.

The Fund may apply the bid security in full or partial payments, as the case may be, of said liquidated damages and in the event the bid security is less than the amount of liquidated damages to which the Fund is entitled, the bidder shall pay the difference, upon demand, to the Fund.

11. The bidder certifies that all wood products that are to be used in the performance of this Contract shall be in accordance with the Specifications and provisions of Section 167 b. of the State Finance Law which Section prohibits the purchase and use of tropical hardwoods.

12. The bidder affirms that it understands and agrees to comply with the procedures of the Fund relative to permissible contacts as required by Sections 139-j(3) and 139-j-(6)(b) of the State Finance Law.

13. The bidder certifies that all information provided or to be provided to the Fund in connection with this procurement is, as required by Section 139-k of the State Finance Law, complete, true and accurate.

Dated _____ _____
(Legal name of person, partnership, joint venture, corporation, or LLC)

(If corporation, affix corporate seal) By _____
(Signature)

Title_____

Firm's Federal ID Number or Social Security Number as applicable _____

Firm's NYS SFS Vendor Identification Number _____

Check: Is Firm NYS-Certified* MBE? ☐ Yes WBE? ☐ Yes

*(*Defined as independent business concerns which are at least 51% owned and controlled by minority group members or women (citizens of the United States or permanent resident aliens who are Black, Hispanic, Asian or American Indian), whose ownerships in the concerns are real, substantial and continuing and who have and exercise the authority to independently control the decisions of the concerns)*

ATTENTION BIDDERS: ALSO FULLY EXECUTE PAGES P-5, P-6, P-7, P-8, P-9, P-10, AND P-11.

THE POST OFFICE ADDRESS OF THE BIDDER

_____

_____

_____

Telephone No._____ Email Address_____

If a Corporation

Name Address

_____ , PRESIDENT _____

_____, SECRETARY _____

_____, TREASURER _____

If a Partnership

Name of Partners	Address
_____	_____
_____	_____
_____	_____

If a Joint Venture

Name of Members	Address
_____	_____
_____	_____
_____	_____

If an Individual

Name of Individual	Address
_____	_____

If a Limited Liability Corporation

Name	Address
_____	_____
_____	_____
_____	_____

STATE UNIVERSITY CONSTRUCTION FUND
H. Carl McCall SUNY Building 353 Broadway ● Albany, New York 12246
Offerer Disclosure of Prior Non-Responsibility Determinations

Name of Individual or Entity Seeking to Enter into the Procurement Contract:

_____

Address:

_____

_____

Name and Title of Person Submitting this Form:

_____

_____

SUCF Project Number: _____ Date: _____

1. Has any Governmental Entity made a finding of non-responsibility regarding the individual or entity seeking to enter into the Procurement Contract in the previous four years? ☐No ☐Yes
If yes, please answer the next questions:

2. Was the basis for the finding of non-responsibility due to a violation of State Finance Law Section139-j: ☐No ☐ Yes
3. Was the basis for the finding of non-responsibility due to the intentional provision of false or incomplete information to a Governmental Entity? ☐No ☐Yes

4. If you answered "yes" to any of the above questions, please provide details regarding the finding of non-responsibility below.

Governmental Entity: _____
Date of Finding of Non-Responsibility: _____
Basis of Finding of Non-Responsibility: _____
_____
_____
_____
(Add additional pages as necessary)

5. Has any Governmental Entity or other governmental agency terminated or withheld a Procurement Contract with the above-named individual or entity due to the intentional provision of false or incomplete information?
☐No ☐Yes
6. If yes, please provide details below.
Governmental Entity: _____
Date of Termination or Withholding of Contract: _____
Basis of Termination or Withholding: _____
_____
_____
_____
_____
_____
(Add additional pages as necessary)
Offerer certifies that all information provided to SUCF with respect to State Finance Law Section 139-k is complete, true and accurate. Submit form with original signature with Proposal.

By: _____ _____
Signature Date

STATE UNIVERSITY CONSTRUCTION FUND
H. Carl McCall SUNY Building 353 Broadway ● Albany, New York 12246

IRAN ENERGY SECTOR DIVESTMENT COMPLIANCE

Printed Name of Entity Seeking to Enter into the Contract:

_____

Address:

_____

Printed Name and Title of Person Executing Certification:

_____

SUCF Project Number: _____

Pursuant to New York State Finance Law §165-a, Iran Divestment Act of 2012 (Act), the Office of General Services is required to post on its web site a list of persons who have been determined to engage in investment activities in Iran ("prohibited entities list"), as defined by the Act. New York State Public Authorities Law § 2879-c, with certain exceptions, prohibits the Fund from entering into or awarding a Contract with persons identified on the prohibited entities list.

CERTIFICATION:

By submission of this bid or proposal, each person (as defined in paragraph (e) of subdivision one of section one hundred sixty five-a of the state finance law) and each person signing on behalf of any other party certifies, and in the case of a joint bid or proposal or partnership each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each person is not on the list created pursuant to paragraph (b) of subdivision 3 of section 165-a of the State finance law.

STATE OF)
)ss.:
COUNTY OF)

The undersigned, being duly sworn, says (a) I am duly authorized to execute this Certification and (b) I hereby certify, under penalty of perjury, that the forgoing Certification is in all respects true and accurate.

Signature of Person Executing
Certification:_____

Subscribed and sworn to before me this_____day of_____,20____.

_____

Notary Public

Submit form with original signatures

STATE UNIVERSITY CONSTRUCTION FUND
H. Carl McCall SUNY Building 353 Broadway ● Albany, New York 12246

Certification Regarding Sexual Harassment Prevention Policies Pursuant to State Finance Law §139-l

By submission of this proposal, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint proposal each party thereto certifies as to its own organization, under penalty of perjury, that the bidder has and has implemented a written policy addressing sexual harassment prevention in the workplace and provides annual sexual harassment prevention training to all of its employees. Such policy shall, at a minimum, meet the requirements of section two hundred one-g of the labor law.

I, _____, hereby affirm, under penalty of perjury, that
Printed Name of Person Executing Certification

I am _____ of the above-named bidder, that I am
Printed Title of Person Executing Certification

authorized to make this certification on behalf of such bidder, and I further certify that this certification is true, accurate and complete to the best of my knowledge and belief.

The undersigned, being duly sworn, says (a) I am duly authorized to execute this Certification and (b) I hereby certify, under penalty of perjury, that the forgoing Certification is in all respects true and accurate.

_____
signature

STATE OF)
) ss.:
COUNTY OF)

On this _____day of _____, 20___ , before me personally came

_____, to me known and known to me to be the person(s) described in and who executed the foregoing instrument and acknowledged that he/she executed the same.

_____
Notary Public

Submit form with original signatures

ENCOURAGING USE OF NEW YORK STATE BUSINESSES IN CONTRACT PERFORMANCE

New York State businesses have a substantial presence in State contracts and strongly contribute to the economies of the state and the nation. In recognition of their economic activity and leadership in doing business in New York State, bidders/proposers for this contract for commodities, services or technology are strongly encouraged and expected to consider New York State businesses in the fulfillment of the requirements of the contract. Such partnering may be as subcontractors, suppliers, protégés or other supporting roles.

Bidders/proposers need to be aware that all authorized users of this contract will be strongly encouraged, to the maximum extent practical and consistent with legal requirements, to use responsible and responsive New York State businesses in purchasing commodities that are of equal quality and functionality and in utilizing services and technology. Furthermore, bidders/proposers are reminded that they must continue to utilize small, minority and women-owned businesses, consistent with current State law.

Utilizing New York State businesses in State contracts will help create more private sector jobs, rebuild New York's infrastructure, and maximize economic activity to the mutual benefit of the contractor and its New York State business partners. New York State businesses will promote the contractor's optimal performance under the contract, thereby fully benefiting the public sector programs that are supported by associated procurements.

Public procurements can drive and improve the State's economic engine through promotion of the use of New York businesses by its contractors. The State therefore expects bidders/proposers to provide maximum assistance to New York businesses in their use of the contract. The potential participation by all kinds of New York businesses will deliver great value to the State and its taxpayers.

Bidders/proposers can demonstrate their commitment to the use of New York State businesses by responding to the question below:

Will New York State Businesses be used in the performance of this contract? ☐ Yes ☐ No

SUCF Project Number: _____

If yes, identify New York State Business(es) that will be used; (list identifying information below).

_____

_____

_____

_____

_____

(Attach additional identifying information with the bid as required)

By: _____ Date: _____
Signature

Print Name and Title: _____

Contractor Name: _____

Contractor Address: _____

STATE UNIVERSITY CONSTRUCTION FUND
H. Carl McCall SUNY Building 353 Broadway ● Albany, New York 12246

EO 177 Certification

The New York State Human Rights Law, Article 15 of the Executive Law, prohibits discrimination and harassment based on age, race, creed, color, national origin, sex, pregnancy or pregnancy-related conditions, sexual orientation, gender identity, disability, marital status, familial status, domestic violence victim status, prior arrest or conviction record, military status or predisposing genetic characteristics.

The Human Rights Law may also require reasonable accommodation for persons with disabilities and pregnancy-related conditions. A reasonable accommodation is an adjustment to a job or work environment that enables a person with a disability to perform the essential functions of a job in a reasonable manner. The Human Rights Law may also require reasonable accommodation in employment on the basis of Sabbath observance or religious practices.

Generally, the Human Rights Law applies to:

- all employers of four or more people, employment agencies, labor organizations and apprenticeship training programs in all instances of discrimination or harassment;
- employers with fewer than four employees in all cases involving sexual harassment; and,
- any employer of domestic workers in cases involving sexual harassment or harassment based on gender, race, religion or national origin.

In accordance with Executive Order No. 177, the Bidder hereby certifies that it does not have institutional policies or practices that fail to address the harassment and discrimination of individuals on the basis of their age, race, creed, color, national origin, sex, sexual orientation, gender identity, disability, marital status, military status, or other protected status under the Human Rights Law.

Executive Order No. 177 and this certification do not affect institutional policies or practices that are protected by existing law, including but not limited to the First Amendment of the United States Constitution, Article 1, Section 3 of the New York State Constitution, and Section 296(11) of the New York State Human Rights Law.

Contractor Name: _____

By: _____ Date: _____
Signature

Print Name and Title: _____

Attachment A – List of Completed Similar Construction Projects

SUCF PROJECT # 081056-00 **BIDDER**

Form Completed By: Date:	Email: Phone Number:

Project #1 Title	Award Date	Contract Amount	Date Completed
Project Description Related to IFB Requirements			
Agency/Owner & Contact Person	Contact Information - Telephone No. & Email Address		
Were you the prime contractor on this project	Was the contract single bid		
Project #2 Title	Award Date	Contract Amount	Date Completed
Project Description Related to IFB Requirements			
Agency/Owner & Contact Person	Contact Information - Telephone No. & Email Address		
Were you the prime contractor on this project	Was the contract single bid		
Project #3 Title	Award Date	Contract Amount	Date Completed
Project Description Related to IFB Requirements			
Agency/Owner & Contact Person	Contact Information - Telephone No. & Email Address		
Were you the prime contractor on this project	Was the contract single bid		

APPENDIX A
For SUCF Project No. _081056-00_

BID BREAKDOWN
In the spaces provided below, insert the bid amounts for the various divisions listed.

DIVISION OR SECTION		**AMOUNT**
1.	DIVISION 1 – GENERAL REQUIREMENTS	$ _____
2.	DIVISION 2 – EXISTING CONDITIONS	$ _____
3.	DIVISION 3 - CONCRETE	$ _____
4.	DIVISION 4 - MASONRY	$ _____
5.	DIVISION 5 - METALS	$ _____
6.	DIVISION 6 – WOODS AND PLASTICS	$ _____
7.	DIVISION 7 – THERMAL AND MOISTURE PROTECTION	$ _____
8.	DIVISION 8 – OPENINGS	$ _____
9.	DIVISION 9 – FINISHES	$ _____
10.	DIVISION 10 – SPECIALTIES	$ _____
11.	DIVISION 11 - EQUIPMENT	$ _____
12.	DIVISION 12 – FURNISHINGS	$ _____
13.	DIVISION 13 – (NOT USED)	$ _____
14.	DIVISION 14 – CONVEYING EQUIPMENT	$ _____
15.	DIVISION 21 – FIRE SUPPRESSION	$ _____
16.	DIVISION 22 – PLUMBING	$ _____
17.	DIVISION 23 – HEATING VENTILATING & A/C (HVAC)	$ _____
18.	DIVISION 26 – ELECTRICAL	$ _____
19.	DIVISION 27 – COMMUNICATIONS	$ _____
20.	DIVISION 28 – ELECTRONIC SAFETY AND SECURITY	$ _____
21.	DIVISION 31 – EARTHWORK	$ _____
22.	DIVISION 32 – EXTERIOR IMPROVEMENTS	$ _____
23.	Sum of all lines above (**Base Bid)**	$ _____
24.	Field Order Allowance	$ _____1,638,650_____
	Total Bid	$ _____

1. This breakdown is not the basis for Contractor payment (Agreement Section 4.08).
2. The Total above should equal the amount in the Contractor's bid Proposal.

Note: Please indicate whether you believe that any information supplied herein is confidential and should be exempt from disclosure under the Freedom of Information Law.

☐ Yes ☐ No

If "yes", you must identify the information you feel is confidential by placing an asterisk (*) in front of the appropriate number(s) and you are requested to attach an additional sheet(s) upon which the basis for such claim(s) is explained.

_____
Name of Contractor

THIS PAGE INTENTIONALLY LEFT BLANK

BID BOND

BOND NO. _____

KNOW ALL PERSONS BY THESE PRESENTS, that

, having an office at

(hereinafter called the "Principal") and the

a corporation created and existing under the laws of the State of ,
having its principal office at

(hereinafter called the "Surety") are held and firmly bound unto the State University Construction Fund (hereinafter called the "Fund") in the full and just sum of

dollars ($)
good and lawful money of the United States of America, or in the full and just sum of the difference between the Total Bid of the Principal and the Total Bid of the bidder submitting the next lowest bid, whichever sum shall be higher, for the payment of which said sum of money, well and truly to be made and done, the Principal binds itself, its heirs, executors, administrators, successors and assigns and the Surety binds itself, its successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted to the Fund a Proposal for

which Proposal is incorporated herein by reference and made a part hereof as fully and to the same extent as if set forth at length herein;

NOW, THEREFORE, the condition of this obligation is such that in the event (1) the Principal's Total Bid is the lowest one submitted and the Principal timely provides the Post-Bid Information required under Sections 7 and 8 of the Information for Bidders or (2) the Fund shall accept the Proposal of the Principal and the Principal shall enter into a Contract with the Fund in accordance with the terms of such Proposal and/or enter into certain prescribed subcontracts in accordance with the terms of such Proposal and give such Bond or Bonds, proof of insurances, and 120-day Schedule as may be specified in the Bidding or Contract Documents, then this obligation shall be null and void, otherwise to remain in full force and effect.

The Surety, for value received, hereby stipulates and agrees that the obligation of said Surety and its Bond shall be in no way impaired or affected by any extension of the time within which the Fund may accept the Proposal of the Principal and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal has hereunto set its hand and seal and the Surety has caused this instrument to be signed by its

and its corporate seal to be hereunto affixed this day of 20 .

_____
Principal

_____
By

(If Corporation, affix corporate seal)

_____
Surety

_____

By (If Corporation, affix corporate seal)

00 43 13 Bid Bond **BB-1** **Dec 2015**

ACKNOWLEDGMENTS

(ACKNOWLEDGMENT BY PRINCIPAL, UNLESS IT BE A CORPORATION)

STATE OF)
) ss.:
COUNTY OF)

On this_____day of_____, 20_____, before me personally came

_____, to me known and known to me to be the person(s) described in and who executed the foregoing instrument and acknowledged that he executed the same.

_____
Notary Public

(ACKNOWLEDGEMENT BY CORPORATION)

STATE OF NEW YORK)
COUNTY OF) SS:

On this_____day of_____, 20____, before me personally came

_____, to me known, who, being by me duly sworn, did depose and say that he/she/they reside(s) in_____; that he/she/they is (are) the_____(president or other officer or director or attorney in fact duly appointed) of the_____(name of corporation), the corporation described in and which executed the above instrument; and that he/she/they signed his/her/their name(s) thereto by authority of the board of directors of said corporation.

_____
Notary Public
;

(ACKNOWLEDGMENT BY SURETY COMPANY)

STATE OF)
) ss.:
COUNTY OF)

On this_____day of_____, 20_____, before me personally came

_____, to me known who, being by me

duly sworn, did depose and say that he resides in
_____;

that he is the _____ of the
_____,
the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that is was so affixed by order of the Board

of Directors of said corporation and that he signed h name thereto by like order; and that the liabilities of said company do not exceed its assets as ascertained in the manner provided by the laws of the State of New York.

_____
Notary Public

00 43 13 Acknowledgment for Bid Bond BB-1 Dec 2015

SECTION 00 43 13 10 - INSTRUCTIONS FOR EXECUTION OF BID BOND AND ACKNOWLEDGEMENT

NOTE: All instructions are numbered in the sequence that they appear on the following Bid Bond sample:

1. Name of Principal.

1a. Address of Principal.

2. Surety name, address *(Note: Must be authorized to do business in NYS as surety).*

3. Surety's State of incorporation.

4. Surety's principal office.

5. Amount of bid security *(in words and figures* **OR** *"5% of amount of bid").*

6. Correct project designation, including SUCF Project No.

7. "Attorney-in-Fact" *(or other authorized representative)* of Surety.

8. Execution date of Bond.

9. Name of Principal.

10. Original signature of Principal's officer (if corporation); partner (if partnership); or individual owner (facsimile or stamped signature not acceptable). *Note: If Principal's signatory is <u>not</u> a corporate officer, such other authorized representative's capacity to execute the Bond on behalf of Principal must be shown by a duly executed document reflecting the grant of such authority, e.g. by a copy of the appropriate Resolution of the Board of Directors of Principal).*

11. Corporate seal of Principal (if a corporation).

12. Name of Surety.

13. Original signature of Surety's Attorney-in-Fact (or other authorized representative). *Note: Facsimile or stamped signature not acceptable.*

14. Corporate seal of Surety. *Note: If the Bond is executed by <u>joint venture</u>, each member of the joint venture must affix its appropriate name, signature, seal, etc., as listed above. Changes, additions, or deletions in the text of the Fund's Bond form are not acceptable.*

The Bond must also have attached to it: (1) Surety Company's Power of Attorney (naming attorney executing Bond); (2) Surety's Certificate (date to be on or after date of Bond execution); (3) Surety's current Financial Statement (no more than two years old).

Note: On the Surety's Financial Statement, "surplus to policy holders" must be in an amount at least ten (10) times the amount of the bid security (Item "5" on Page BB-1).

BID BOND

BOND NO. _____

KNOW ALL PERSONS BY THESE PRESENTS, that

-1-

, having an office at

-1a-

(hereinafter called the "Principal") and the

-2-

a corporation created and existing under the laws of the State of **-3-** ,
having its principal office at

-4-

(hereinafter called the "Surety") are held and firmly bound unto the State University Construction Fund (hereinafter called the "Fund") in the full and just sum of

-5-

dollars ($)
good and lawful money of the United States of America, or in the full and just sum of the difference between the Total Bid of the Principal and the Total Bid

of the bidder submitting the next lowest bid, whichever sum shall be higher, for the payment of which said sum of money, well and truly to be made and done, the Principal binds itself, its heirs, executors,

administrators, successors and assigns and the Surety binds itself, its successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted to the Fund a Proposal for

-6-

which Proposal is incorporated herein by reference and made a part hereof as fully and to the same extent as if set forth at length herein;

NOW, THEREFORE, the condition of this obligation is such that in the event (1) the Principal's Total Bid is the lowest one submitted and the Principal timely provides the Post-Bid Information required under Sections 7 and 8 of the Information for Bidders or (2) the Fund shall accept the Proposal of the Principal and the Principal shall enter into a Contract with the Fund in accordance with the terms of such Proposal and/or enter into certain prescribed subcontracts in accordance with the terms of such Proposal and give such Bond or Bonds, proof of insurances, and 120-day Schedule as may be specified in the Bidding or Contract Documents, then this obligation shall be null and void, otherwise to remain in full force and effect.

The Surety, for value received, hereby stipulates and agrees that the obligation of said Surety and its Bond shall be in no way impaired or affected by any extension of the time within which the Fund may accept the Proposal of the Principal and said Surety does hereby waive notice of any such extension.

IN WITNESS WHEREOF, the Principal has hereunto set its hand and seal and the Surety has caused this instrument to be signed by its **-7-**

and its corporate seal to be hereunto affixed this day of **-8-** 20 .

-9-

_____
Principal

-10-

_____
By

(If Corporation, affix corporate seal) **-11-**

-12-

_____
Surety

-13-

_____

By

(If Corporation, affix corporate seal) **-14-**

INSTRUCTIONS FOR EXECUTION OF ACKNOWLEDGMENTS

NOTE: All instructions are numbered in the sequence that they appear on the following Acknowledgment sample:

Acknowledgment by Individual Principal:

1. State where executed.
2. County where executed.
3. Date of execution.
4. Month of execution.
5. Year of execution.
6. Name of Individual Principal.
7. Original signature of Notary before whom Acknowledgment is signed. *NOTE: Facsimile or stamped signature not acceptable.*
8. Attach stamp or seal of Notary, showing (current) date of expiration of commission.

Acknowledgment by Corporate Principal:

1. State where executed.
2. County where executed.
3. Date of execution.
4. Month of execution.
5. Year of execution.
6. Name of Principal's Corporate Officer (or authorized representative).
7. Residence of Principal's Corporate Officer (or authorized representative).
8. Title of Corporate Officer (or authorized representative).
9. Full name of Principal.
10. Original signature of Notary before whom Acknowledgment is signed. *NOTE: Facsimile or stamped signature not acceptable.*
11. Attach stamp or seal of Notary, showing (current) date of expiration of commission.

Acknowledgment By Surety:

1. State where executed.
2. County where executed.
3. Date of execution.
4. Month of execution.
5. Year of execution.
6. Name of Surety's Attorney-in-Fact (or authorized representative).
7. Residence of Surety's Attorney-in-Fact (or authorized representative).
8. "Attorney-in-Fact" (or other authorized representative) of Surety.
9. Full name of Surety.
10. Original signature of Notary before whom Acknowledgment is signed. *NOTE: Facsimile or stamped signature not acceptable.*
11. Attach stamp or seal of Notary showing (current) date of expiration of commission.

NOTE: The date of all Acknowledgments must be on or after the date of execution of the Bond (Item "8" on page BB-1).

ACKNOWLEDGMENTS

(ACKNOWLEDGMENT BY PRINCIPAL, UNLESS IT BE A CORPORATION)

STATE OF **-1-**)
) ss.:
COUNTY OF **-2-**)

On this **-3-** day of **-4-**, 20 **-5-** , before me personally came **-6-**, to me known and known to me to be the person(s) described in and who executed the foregoing instrument and acknowledged that he executed the same.

-7-
Notary Public

-8-

(ACKNOWLEDGMENT BY PRINCIPAL, IF A CORPORATION)

STATE OF **-1-**)
) ss.:
COUNTY OF **-2-**)

On this **-3-** day of **-4-**, 20 **-5-** , before me personally came **-6-**, to me known who, being by me duly sworn, did depose and say that he resides in **-7-**;

that he is the **-8-** of the **-9-**, the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that is was so affixed by order of the Board of Directors of said corporation and that he signed h name thereto by like order.

-10-
Notary Public

-11-

(ACKNOWLEDGMENT BY SURETY COMPANY)

STATE OF **-1-**)
) ss.:
COUNTY OF **-2-**)

On this **-3-** day of **-4-**, 20 **-5-**, before me personally came **-6-**, to me known who, being by me duly sworn, did depose and say that he resides in **-7-**;

that he is the **-8-** of the **-9-**,

the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that is was so affixed by order of the Board of Directors of said corporation and that he signed h name thereto by like order; and that the liabilities of said company do not exceed its assets as ascertained in the manner provided by the laws of the State of New York.

-10-

Notary Public

State University Construction Fund
AGREEMENT

This Agreement made as of the day of X, 20XX, by and between the State University Construction Fund, whose address is The H. Carl McCall SUNY Building, 353 Broadway, Albany, New York 12246, hereinafter referred to as the "Fund", and hereinafter referred to as the "Contractor".

WITNESSETH:

The parties hereto agree that the Contractor shall (a) furnish and perform all work of every kind required and all other things necessary to complete in the most substantial and workmanlike manner the construction of in strict accordance with the Contract Documents;

(b) complete all work necessary for substantial completion by 11/09/27 or within the time to which such completion may have been extended in accordance with the Contract Documents; (c) in the event it fails to substantially complete all the work on time, pay to the Fund liquidated damages in the amount of for each calendar day of delay of substantially completing all the work; and (d) do everything required by the Contract; subject, however, to the terms, provisions and conditions listed hereinafter.

Article I General Provisions

Section 1.01 **Definitions**

Where the following words and expressions are used in the Contract Documents it is understood that they have the meaning set forth as follows:

Allowance Any and all work and materials which may be required of the Contractor in performing work set forth under one or more allowances to this Contract shall be Work, as defined herein, which shall be performed in accordance with the base schedule for the performance of the Contractor's Work. Contractor shall not be entitled to an extension of time for the performance of an allowance or all allowances.

Consultant The Architect or Engineer named in the Notice to Bidders or such other person or firm designated by the Fund to provide general administration of the Contract and inspection of the work.

Bidding Notice to Bidders, Information for Documents Bidders and Proposals

Bonds Performance Bond and Labor and Material Bond

Delay For purposes of this document and as used herein and in any other contract documents between the Contractor and the Fund the word "delay" shall be interpreted broadly and shall include by way of example only and not by way of limitation: delay, disruption, interference, inefficiencies, impedance, hindrance, acceleration, resequencing, schedule impacts, lack of timeliness by the Fund and/or Consultant, and lack of coordination, cumulative impact of multiple change orders, delay and other impacts.

Contract or The Agreement, Bonds, Specifications, Contract Project Manual, Drawings, Addenda

Documents issued prior to the opening of bids and Change Orders issued after award of the Contract.

Fund or Owner State University Construction Fund

Notice of Award Letter of Intent

Project The facility or facilities to be constructed including all usual, appropriate and necessary attendant work shown on, described in or mentioned in the Contract.

Site The area within the Contract limit lines, as shown on the Drawings, and all other areas upon which the Contractor is to perform work.

Substantial Completion of Work Substantial Completion is the completion so that the Project can be fully occupied and used for the purposes for which it is intended. Substantial Completion includes: (1) completion of all work required for the issuance of a code compliance certificate, or a temporary approval for occupancy, completed in a manner that includes no uncorrected deficiency or material violation of the Building Code of New York State within the area or work for which the certificate is to be issued; (2) completion of all building systems and functional testing of said systems (other than tests that cannot be performed due to the seasonal environmental conditions in effect at the time of completion); (3) acceptance and approval of the Operating Instructions and Manuals and Training of Campus Personnel; and (4) the sum of values determined for Punch List work at the time of Substantial Completion shall not exceed one (1) percent of the amount of the Contract consideration unless otherwise agreed to by the Fund.

Work The using, performing, installing, furnishing and supplying of all materials, equipment, labor, services and incidentals necessary or proper for or incidental to the successful completion of the Project and the carrying out of all duties and obligations imposed upon the Contractor by the Contract.

Section 1.02 Captions

The titles or captions of Articles and Sections of the Contract are intended for convenience and reference purposes only and in no way define, limit or describe the scope or intent thereof or of the Contract or in any way affect the Contract.

Section 1.03 Nomenclature

Materials, equipment or other work described in words and abbreviations which have a well-known, technical or trade meaning shall be interpreted as having such meaning in connection with the Contract.

Section 1.04 Entire Agreement

The Contract constitutes the entire agreement between the parties hereto and no statement, promise, condition, understanding, inducement or representation, oral or written, expressed or implied, which is not contained herein shall be binding or valid and the Contract shall not be changed, modified, or altered in any manner except by an instrument in writing executed by the parties hereto.

Section 1.05 Successors and Assigns

The Contract shall bind the successors, assigns and representatives of the parties hereto.

Section 1.06 Accuracy and Completeness of Contract Documents

(1) The Contract Documents are complementary and what is called for by any one shall be as binding as if called for by all. The intention of the Documents is to include all materials, plant, equipment, tools, skill and labor of every kind necessary for the proper execution of the work and also those things which may be reasonably inferable from the Contract Documents as being necessary to produce the intended results.

(2) The Contract Documents contemplate a finished piece of work of such character and quality as is reasonably inferable from them. The Contractor acknowledges that the Contract consideration

includes sufficient money allowance to make its work complete and operational and in compliance with good practice and it agrees that inadvertent minor discrepancies or omissions or the failure to show details or to repeat on any part of the Contract Documents the figures or notes given on another shall

not be the cause for additional charges or claims. In case of a conflict between any part or parts of the Contract Documents with any other part or parts thereof, as contrasted to an omission or failure to show details or to repeat on any part of the Contract Documents the figures or notes given on another part thereof, the following shall be given preference, in the order hereinafter set forth, to determine what work the Contractor is required to perform: (a) Addenda (later dates to take preference over earlier dates); (b) Amendments to Agreement; (c) Agreement; (d) Specifications; (e) Schedules; (f) Large scale detail Drawings (detail drawings having a scale of 3/4" and over); (g) Large scale plan and section Drawings (plan and section drawings having a scale equal to or larger than that used for the basic floor or site plan, as the case may be); (h) Small scale detail Drawings (detail drawings having a scale of less than 3/4"); and (i) Small scale plan and section Drawings (plan and section drawings having a scale less than that used for the basic floor or site plan, as the case may be). In the event of such a conflict between or among parts of the Contract Documents that are entitled to equal preference, the more expensive way of doing the work, the better quality or greater quantity of material shall govern unless the Fund otherwise directs.

Section 1.07 Organization of Contract Documents

The Specifications and Drawings are generally divided into trade sections for the purpose of ready references, but such division is arbitrary and such sections shall not be construed as the prescription by the Consultant or the Fund of the limits of the work of any subcontractor or as a determination of the class of labor or trade necessary for the fabrication, erection, installation or finishing of the work required. The Contractor will be permitted to allot the work of subcontractors at its own discretion regardless of the grouping of the Specifications and Drawings. It shall be the Contractor's responsibility to settle definitively with each subcontractor the portions of the work which the latter will be required to do. The Fund and the Consultant assume no responsibility whatever for any jurisdiction claimed by any of the trades involved in the work.

Section 1.08 Furnishing of Contract Documents

The Fund shall establish the format for the Contract Documents (hard copy and/or electronic media) at the start of the Project. The Contractor shall be furnished, free of charge, with two (2) copies of the Specifications and Drawings in the selected format(s). Any other copies of the Specifications and Drawings which the

Contractor may desire can be obtained at the Contractors expense.

Section 1.09 Examination of Contract Documents and Site

By executing the Contract, the Contractor agrees that it has carefully examined the Contract Documents together with the site of the proposed work as well as its surrounding territory; that it is fully informed regarding all the conditions affecting the work to be done and the labor and materials to be furnished for the completion of the Contract; and that its information has been acquired by personal investigation and research and not in the estimates and records of the Fund.

Section 1.10 Invalid Provisions

If any term or provision of the Contract Documents or the application thereof to any person, firm or corporation or circumstance shall, to any extent, be invalid or unenforceable, the remainder of the Contract Documents, or the application of such terms or provisions to persons, firms or corporations or circumstances other than those to which it is held invalid or unenforceable, shall not be affected thereby and each term or provision of the Contract Documents shall be valid and be enforced to the fullest extent permitted by law.

Section 1.11 No Collusion or Fraud

The Contractor hereby agrees that the Contract was secured without collusion or fraud and that neither any officer nor any employee of the Fund has or shall have a financial interest in the performance of the Contract or in the supplies, work or business to which it relates, or in any portion of the profits thereof.

Section 1.12 Notices

(1) All notices permitted or required hereunder shall be in writing and shall be transmitted either:

a. via certified or registered United States mail, return receipt requested;
b. by personal delivery;
c. by expedited delivery service; or
d. by email if actually received by the Fund. Contractor bears the burden of service by email and receipt of email by the Fund.

Such notices shall be addressed as follows or to such different addresses as the parties may from time to time designate:

The State University Construction Fund
Name:
Title: Project Coordinator
The H. Carl McCall SUNY Building
353 Broadway, Albany, NY 12246
Telephone Number:
E-mail address:

Contractor
Company Name:
Designated Contact Name:
Contact Title: Project Manager
Address:
Telephone Number:
E-mail Address:

(2) Any such notice shall be deemed to have been given either at the time of personal delivery or actual receipt by the Fund, or in the case of email, upon receipt by the Fund.

(3) The parties may, from time to time, specify any new or different address in the United States as their address for purpose of receiving notice under this Agreement by giving fifteen (15) days written notice to the other party sent in accordance herewith. The parties agree to mutually designate individuals as their respective representatives for the purposes of receiving notices under this Agreement. Additional individuals may be designated in writing by the parties for purposes of implementation and administration/billing, resolving issues and problems and/or for dispute resolution.

Section 1.13 Singular-Plural; Male-Female

As used in the Contract Documents, the singular of any word or designation, whenever necessary or appropriate, shall include the plural and vice versa, and the masculine gender shall include the female and neutral genders and vice versa.

Article II
Contract Administration and Conduct

Section 2.01 Consultant's Status

(1) The Consultant, as the Fund's representative, shall provide general administration of the Contract and inspection of the work. The Consultant will not be responsible for construction means, methods, techniques, sequences or procedures, or for safety precautions and programs in connection with the work, and it will not be responsible for the Contractor's failure to carry out the work in accordance with the Contract Documents. The Consultant's duties, services and

work shall in no way supersede or dilute the Contractor's obligation to perform the work in conformance with all Contract requirements, but it is empowered by the Fund to act on its behalf with respect to the proper execution of the work and to give instructions and/or direction when necessary to require such corrective measures as may be necessary, in its professional opinion, to insure the proper execution of the Contract or to otherwise protect the Fund's interest.

(2) The Consultant shall have the authority to stop the work or to require and/or direct the prompt execution thereof whenever such action may be necessary, in its professional opinion, to insure the proper execution of the Contract or to otherwise protect the interests of the Fund.

(3) Except as otherwise provided in the Contract, the Consultant shall determine the amount, quality, acceptability, fitness and progress of the work covered by the Contract and shall decide all questions of fact which may arise in relation to the interpretation of the plans and Specifications, the performance of the work and the fulfillment by the Contractor of the provisions of the Contract. The Consultant shall in the first instance be the interpreter of the provisions of the Contract and the judge of its performance and it shall use its power under the Contract to enforce its faithful performance.

Section 2.02 Finality of Decisions

(1) Any decision or determination of the Consultant under the provisions of the Contract shall be final, conclusive and binding on the Contractor unless the Contractor shall, within ten (10) working days after such decision, make and deliver to the Fund a verified written statement of its contention that the decision of the Consultant is contrary to a provision of the Contract. The Fund shall thereupon determine the validity of the Contractor's contention. Pending decision by the Fund, the Contractor shall proceed in accordance with the Consultant's decision.

(2) Wherever it is provided in the Contract Documents that an application must be made to the Fund and/or determination made by the Fund, the Fund's decision on such application and/or its determination under the Contract Documents shall be final, conclusive and binding upon the Contractor unless the Contractor, within ten (10) working days after receiving notice of the Fund's decision or determination, files a written statement with the Fund and the Consultant that it reserves its rights in connection with the matters covered by said decision

or determination and after a court of competent jurisdiction determines the Fund's said decision or determination to be fraudulent, capricious, arbitrary or so grossly erroneous as necessarily to imply bad faith, in an action brought in accordance with Section 4.24.

Section 2.03 Claims and Disputes

(1) If the Contractor claims (i) that any work it has been ordered to do is extra work or (ii) that it has performed or is going to perform extra work or (iii) that any action or omission of the Fund or the Consultant is contrary to the terms and provisions of the Contract, it shall:

a. Promptly comply with such order;

b. Notwithstanding the provisions of Section 1.12 of the Agreement and any other provisions of the Contract documents to the contrary, file with the Fund and the Consultant, within five (5) working days after being ordered to perform the work claimed by it to be extra work or within five (5) working days after commencing performance of the extra work, whichever date shall be the earlier, or within five (5) working days after the said action or omission on the part of the Fund or the Consultant occurred, a written notice of the basis of its claim and request a determination thereof,

c. Notwithstanding the provisions of Section 1.12 of the Agreement and any other provisions of the Contract documents to the contrary, file with the Fund and the Consultant, within thirty (30) calendar days after said alleged extra work was required to be performed or said alleged extra work was commenced, whichever date shall be the earlier, or said alleged action or omission by the Fund or the Consultant occurred, a verified detailed statement, with documentary evidence, of the items and basis of its claim, including an initial and updated detailed Time Progress Schedule,

d. Produce for the Fund's examination, upon notice from the Fund, such information and documentation as directed by the Fund, which shall include but not be limited to job cost reports and all estimates and documentation used to develop the Bid Proposal, all its books of account, bills, invoices, payrolls, subcontracts, time books, progress records, daily reports, bank deposit books, bank statements, checkbooks and cancelled checks, showing all of its actions and transactions in connection with or relating to or arising by reason of its claim, and submit persons in its employment and in its subcontractors'

employment for examination under oath by any person designated by the Fund to investigate any claims made against the Fund under the Contract, such examination to be made at the offices of the Contractor; and

e. Proceed diligently, pending and subsequent to the determination of the Fund with respect to any such disputed matter, with the performance of the Contract and in accordance with all instructions of the Fund and the Consultant.

(2) The Contractor's failure to comply with any or all parts of subdivision b, c and d of paragraph (1) of this Section shall be deemed to be: (i) a conclusive and binding determination on its part that said order, work, action or omission does not involve extra work and is not contrary to the terms and provisions of the Contract; and (ii) a waiver by the Contractor of all claims for additional compensation or damages as a result of said order, work, action or omission. The provisions of subdivision b, c and d of paragraph (1) of this Section are for the purpose of enabling the Fund to avoid waste of public funds by affording it promptly the opportunity to cancel or revise any order, change its plans, mitigate or remedy the effects or circumstances giving rise to a claim or take such other action as may seem desirable and to verify any claimed expenses or circumstances as they occur. Compliance with such provisions is essential whether or not the Fund is aware of the circumstances of any order or other circumstances which might constitute a basis for a claim and whether or not the Fund has indicated it will consider a claim in connection therewith.

(3) The Contractor’s failure to submit and maintain a Time Progress Schedule in accordance with Section 3.02 of the Agreement shall be deemed to be a waiver by the Contractor of all claims for additional time, compensation or damages as a result of any condition which is an alleged cause of delay in the completion of the work. The Schedule of Record, regularly updated and submitted at required durations in accordance with the provisions of the General Requirements, Section paragraph titled “Project Schedule”: (i) informs the Fund and affords it promptly of regular opportunities to change its plans or mitigate or remedy the effects or circumstances giving rise to a claim of delay in the completion of the work or take such other action as may seem desirable to verify any claimed circumstances as they occur; and (ii) forms a record which becomes the basis of the Fund’s verification of an alleged cause of delay in the completion of the work.

(4) No person has power to waive or modify any of the foregoing provisions and, in any action against the Fund to recover any sum in excess of the sum certified by the Fund to be due under or by reason of the Contract, the Contractor must allege in its complaint and prove at the trial compliance with the provisions of this Section.

(5) Nothing in this Section shall in any way affect the Fund's right to obtain an examination before trial or a discovery and inspection in any action that might be instituted by or against the Fund or the Contractor.

Section 2.04 Omitted Work

The Fund reserves the right at any time during the progress of the work to delete, modify or change the work covered by the Contract, by a Change Order or Field Order thereto providing for either a reduction or omission of any portion of the work, without constituting grounds for any claim by the Contractor for allowances for damages or for loss of anticipated profits and in such event a deduction shall be made from the Contract consideration, the amount of which is to be determined in accordance with the provisions of Section 4.02 or 4.05A of the Agreement.

Section 2.05 Extra Work

(1) The Fund reserves the right at any time during the progress of the work to add, modify or change the work covered by the Contract by Change Order or Field Order or as otherwise required by the Fund thereto providing for extra work of either a qualitative or quantitative nature and in such event the Contract consideration may be increased by an amount to be determined in accordance with the provisions of Sections 4.02 and 4.05A of the Agreement and the completion date for all or any part of the work may be extended for such period of time as may be determined by the Fund as necessary, because of the extra work, to complete the work or any part thereof.

(2) Nothing in the Contract Documents shall excuse the Contractor from proceeding with the extra work as directed. The terms and conditions of the Contract Documents shall be fully applicable to all extra work.

(3) The Contractor shall have no claim for extra work or an extension of time if the performance of such work, in the judgment of the Consultant, is made necessary or desirable because of any act or omission of the Contractor which is not in accordance with the Contract.

(4) Notwithstanding the provisions of Section 2.02 of the Agreement and any other provisions of the Contract Documents to the contrary, an officer of the Fund, after conferring with the Consultant, shall have the right to overrule a determination or decision of the Consultant, that relates to whether certain work is included in the Contract Documents or is extra work, which he or she believes is incorrect; in the event an officer exercises such right, his or her determination or decision shall be final, conclusive and binding upon the Contractor and the Fund unless the same shall be determined by a court of competent jurisdiction to have been fraudulent, capricious, arbitrary or so grossly erroneous as necessarily to imply bad faith.

Section 2.06 Contractor to Give Personal Attention

(1) The Contractor shall give its constant personal attention to all the work while it is in progress and shall place the work in charge of a competent and reliable full-time superintendent acceptable to the Consultant and the Fund who shall have authority to act for the Contractor and who shall be accountable to the Consultant to the extent provided in the Contract. Unless the superintendent proves to be unsatisfactory to the Contractor and ceases to be in its employ, such superintendent shall not be changed without the written permission of the Consultant and the Fund.

(2) When the Contractor and its superintendent are temporarily absent from the site of the work, the Contractor or its superintendent shall designate a responsible supervisory employee, approved by the Consultant and the Fund, to receive such orders as the Consultant or its representative may give. At no time shall any work be conducted on the site in the absence of an individual present who has been so designated by the Contractor or its superintendent as having authority to receive and execute instructions given by the Consultant or its representative.

(3) If the superintendent, project manager or other supervisory employees are not satisfactory to the Fund, the Contractor shall, if directed by the Fund, immediately replace such supervisory employees with other supervisory employees acceptable to the Consultant and the Fund. Such replacement and all related impacts shall be at no additional cost to the Fund.

[Instructions: See Amendments for the applicability of this section.]

(4) In addition to the superintendent required by 2.06(1) and (2), provide a full-time Project Manager who has ten (10) years' experience as a Project

Manager with experience on three (3) other projects of similar size and scope. "Full-time" in the previous sentence is defined as being on the site of the work at any time work is being performed unless an absence is approved by the Consultant and the Fund. The Project Manager shall provide constant personal attention in managing the prosecution of all the work while it is in progress and shall respond to concerns expressed by the Consultant and the Fund in a responsible and reliable manner. The Project Manager shall not be obligated to perform any other work that is likely to impair his/her attention to the prosecution and completion of the work of this Contract. The Project Manager shall be acceptable to the Consultant and the Fund and shall not be replaced without written permission of the Consultant and the Fund unless the Project Manager proves to be unsatisfactory to the Contractor or ceases to be in its employ. The value of the Project Manager in the Contract Breakdown required in Section 4.08 of Article IV shall be fixed at $10,000 for each month, or portion thereof, prior to the substantial completion date specified on page A-1 of the Agreement.

Section 2.07 Employment of Workers

The Contractor shall at all times employ competent and suitable workers and equipment which shall be sufficient to prosecute all the work to full completion in a disciplined orderly manner and in accordance with the Time Progress Schedule and the contractually required time of performance. All workers engaged in special or skilled work shall have had sufficient experience in such work to properly and satisfactorily perform the same. Should the Consultant deem any employee of the Contractor or any subcontractor incompetent, careless, insubordinate or otherwise objectionable or whose continued employment on the work is deemed by the Consultant to be contrary to the public interest, it shall so advise the Contractor and the latter shall dismiss or shall cause the subcontractor, if such employee is employed by the latter, to dismiss such employee and such employee shall not again be employed on the work to be performed under the Contract without obtaining the prior written approval of the Consultant.

Section 2.08 Detailed Drawings and Instructions

Upon timely notice from the Contractor that supplementary information is required, the Consultant shall furnish additional instructions, by means of Drawings or otherwise, necessary for the proper execution of the work. All such Drawings and instructions shall be consistent with the Contract Documents, true developments thereof and reasonably inferable therefrom. The work shall be executed in conformity therewith and the Contractor shall do no work without proper Drawings and/or instructions.

Section 2.09 Contract Documents to Be Kept at Site

The Contractor shall keep at the site of the work a copy of the Drawings and Specifications and shall at all times give the Consultant and the Fund access thereto.

Section 2.10 Permits and Building Codes

The Contractor shall obtain from the proper authorities all permits legally required to carry on its work, pay any and all taxes and fees legally required and shall be responsible for conducting its operations in accordance with the provisions of such permits. Except as otherwise expressly provided in the Contract Documents, all of the work covered by this Contract which is to be performed on property owned by the State University of New York is not subject to the building code of any city, county or other political subdivision of the State of New York. It is, however, subject to the provisions of the Building Code of New York State and the applicable Federal and State health and labor laws and regulations.

Section 2.11 Surveys

(1) From the data shown on the Drawings and identified at the site by the Consultant, a licensed surveyor, to be designated and paid for by the Fund, shall establish one (1) fixed benchmark and one (1) fixed base line at the site. The Contractor shall work from the benchmarks and base lines shown on the Drawings, identified at the site by the Consultant and established at the site by the aforesaid surveyor and shall establish such supplementary bench marks and base lines that are required in order for it to lay out the work. The Contractor shall be responsible for all measurements that may be required for execution of the work to the exact position and elevation as prescribed in the Specifications, shown on the Drawings, or as the same may be modified at the direction of the Consultant to meet changed conditions or as a result of modifications to the work covered by the Contract.

(2) The Contractor shall furnish at its own expense such stakes and other required equipment, tools and materials, and all labor as may be required in laying out any part of the work. If, for any reason,

monuments are disturbed, it shall be the responsibility of the Contractor to reestablish them, without cost to the Fund, as directed by the Consultant. The Consultant may require that construction work be suspended at any time when location and limit marks established by the Contractor are not reasonably adequate to permit checking completed work or the work in progress.

(3) In all multiple-story construction, the Contractor shall establish and maintain line marks at each floor level and grade marks four (4) feet above the finished floor at each floor level.

Section 2.12 Site Conditions

(1) The Contractor acknowledges that it has assumed the risk and that the Contract consideration includes such provision as it deems proper for all physical conditions and subsurface conditions as it could reasonably anticipate encountering from the provisions of the Contract Documents, borings, rock cores, topographical maps and such other information as the Fund or the Consultant made available to it prior to the Fund's receipt of bids or from its own inspection and examination of the site prior to the Fund's receipt of bids.

(2) In the event that the Contractor encounters subsurface physical conditions or other latent physical conditions at the site differing substantially from those shown on or described or indicated in the Contract Documents and which could not have been reasonably anticipated from the aforesaid information made available by the Fund or the Consultant or from the Contractor's aforesaid inspection and examination of the site, it shall give immediate notice to the Consultant of such conditions before they are disturbed. The Consultant will thereupon promptly investigate the conditions and, if it finds that they do substantially differ from that which should have been reasonably anticipated by the Contractor, it shall make such changes in the Drawings and Specifications as may be necessary and a Change Order or Field Order may be issued, the amount of which shall be determined in accordance with the provisions of Sections 4.02 and 4.05A, to reflect any increase or decrease in the cost of, or the time required for, performance of the Contract as a result of any of the aforesaid changes made by the Consultant and/or as a result of such unanticipated subsurface conditions.

Section 2.13 Right to Change Location

When additional information regarding the subsurface conditions becomes available to the Fund as a result

of the excavation work, further testing or otherwise, it may be found desirable to change the location, alignment, dimensions or grades to conform to such conditions. The Fund reserves the right to make such reasonable changes in the work as, in its opinion, may be considered necessary or desirable; such changes and any adjustments in the Contract consideration as a result thereof are to be made in accordance with the provisions of Sections 2.04, 2.05 4.02 and 4.05A of the Agreement.

Section 2.14 Unforeseen Difficulties

Except as otherwise expressly provided in Section 2.12 of the Agreement and in other Sections of the Contract Documents, the Contractor acknowledges that it has assumed the risk and that the Contract consideration includes such provisions as it deems proper for any unforeseeable obstacles or difficulties which it may encounter in the performance of the work.

Section 2.15 Moving Materials and Equipment

Should it become necessary, in the judgment of the Consultant, at any time during the course of the work to move materials which are stored on the site and equipment which has been temporarily placed thereon, the Contractor upon request of the Consultant shall move them or cause them to be moved at its sole cost and expense; provided, however, if materials and equipment that have been stored or placed by the Contractor at a location on the site expressly approved, in writing, by the Consultant and the same are moved or caused to be moved by the Contractor at the Consultant's request, such removal shall be deemed extra work and the Contractor shall be compensated therefor in accordance with the provisions of Sections 4.02 and 4.05A of the Agreement.

Section 2.16 Other Contracts

(1) Prior to and during the progress of the work hereunder the Fund reserves the right to let or permit the letting of other contracts relating to the Project or in connection with work on sites within the Contract limit lines or adjoining or adjacent to that on which the work covered by this Contract is to be performed. In the event such other contracts are let, or have previously been let, the Contractor and such other contractors shall coordinate their work with each other, arrange the sequence of their work to conform with the progressive operation of all the work covered by such contracts and afford each other reasonable opportunities for the introduction and storage of their materials, supplies and equipment and the execution

of their work. If the Contractor or such other contractors contend that their work or the progress thereof is being interfered with by the acts or omissions of the other or others or that there is a failure to coordinate or properly arrange the sequence of the work on the part of the Contractor or such other contractors, they shall, within five (5) working days of the commencement of such interference or failure of coordination or failure to perform work in proper sequence, give written notification to the Fund and the Consultant of such contention. Upon receipt of such notification or on its own initiative, the Consultant shall investigate the situation and issue such instructions to the Contractor or such other contractors with respect thereto as it may deem proper. The Consultant shall determine the rights of the Contractor and of such other contractors and the sequence of work necessary to expedite the completion of all work covered by this Contract in relation to the work covered by said other contracts.

(2) The Contractor agrees that it has and will make no claim for damages against the Fund by reason of any act or omission to act by any other contractor or in connection with the Consultant's or Fund's acts or omissions to act in connection with such other contractor, but the Contractor shall have a right to recover such damages from the other contractors.

(3) Not Used.

(4) If the proper and accurate performance of the work covered by the Contract depends upon the proper performance and execution of work not included herein or depends upon the work of any other contractor, the Contractor shall inspect and promptly report to the Consultant any defects in such work that render it unsuitable for proper execution and results. Its failure to so inspect and report shall constitute an acceptance of the other contractor's work as fit and proper for the reception of the work covered by the Contract, except as to latent defects which may be discovered thereafter.

Section 2.17 Inspection and Testing

(1) All materials and workmanship shall be subject to inspection, examination and testing by the Consultant and the Fund at all times during the performance of the work and at all places where the work is carried on. Except as otherwise herein specified, the Fund shall pay for the cost of inspection, examination and testing by the Consultant or the Fund. If, however, the tests prove that the materials and/or work tested do not meet the requirements of the Contract, then the entire cost of such tests and any additional testing and or inspections required until the

work is deemed compliant is to be borne by the Contractor. The Consultant will have the right to reject defective material and workmanship furnished by the Contractor or require its correction. The Contractor, without charge therefor, shall satisfactorily and promptly correct all rejected work and replace all rejected material with proper material.

(2) The Contractor shall promptly segregate and remove from the site of the work all rejected material and work. If the Contractor shall fail to proceed at once with the replacing of rejected material and/or correction of defective workmanship, the Fund may, by contract or otherwise, replace such material and/or correct such workmanship, and charge the costs thereof to the Contractor or it may cancel the Contract and terminate the Contractor's employment as provided in the Agreement.

(3) The Contractor, without additional charge, shall promptly furnish all reasonable facilities, labor materials and equipment with associated operators necessary for the safe and convenient access, inspection and testing that may be required by the Consultant or the Fund.

(4) If the Contract Documents or the Consultant's instructions or the applicable laws, ordinances or regulations of any governmental authority require any part of the work covered by the Contract to be specially tested or inspected, the Contractor shall give the Consultant timely notice of its readiness for such testing or inspection or, if the same is to be performed by a governmental authority, of the date fixed therefor. If any such work, without the written permission of the Consultant, should be covered up prior to such testing or inspection, the Contractor, at its sole cost and expense must, if directed by the Consultant, uncover the same for testing or inspection and reconstruct same after the tests or inspection are conducted. All certificates of inspection or testing, involving the Contractor's work, required to be obtained from governmental authorities are to be secured by the Contractor at its sole cost and expense.

(5) Should it be considered necessary or advisable by the Consultant at any time before final acceptance of the entire work to make an examination of work already completed by removing or tearing out same, the Contractor, upon request, shall furnish all necessary facilities, labor and material to perform such examination. If the work subject to such examination is found to be defective or nonconforming in any manner due to the fault of the Contractor or any of its subcontractors, such uncovering or destruction and necessary reconstruction, even though such includes

work not covered in the Contract, shall be at the expense of the Contractor. If, however, such work after testing and examination is found to be satisfactory, the Fund will pay the Contractor the cost of such uncovering or destruction and reconstruction, such cost to be determined as in the case of extra work as provided in Sections 4.02 and 4.05A.

(6) Inspection of material and furnished articles to be incorporated in the work may be made at the place of production, manufacture or shipment unless otherwise stated herein. The inspection of material and workmanship for final acceptance as a whole or in part will be made at the site of the work.

Section 2.18 Subcontractors

(1) Except for subcontractors designated by the Fund, or required to be named at any earlier date, pursuant to the provisions of the Information for Bidders, within thirty (30) calendar days after receipt of the Notice to Proceed, the Contractor must submit a written statement to the Consultant giving the name and address of all proposed subcontractors. Said statement must contain a description of the portion of the work and materials which the proposed subcontractors are to perform and furnish and any other information tending to prove that the proposed subcontractors have the necessary facilities, skill, integrity, past experience and financial resources to perform the work in accordance with the terms and provisions of the Contract Documents.

(2) If the Consultant finds that the proposed subcontractors are qualified, it will so notify the Contractor within ten (10) working days after receipt of the aforesaid information. If the determination is to the contrary, however, the Consultant within such period will notify the Contractor of such determination and the latter, unless it decides to do such work itself and is qualified, in the Consultant's opinion, to do such work, must, within ten (10) working days thereafter, submit similar information with respect to other proposed subcontractors.

(3) The Consultant's approval of a subcontractor and/or the Fund's designation of a subcontractor pursuant to the provisions of the Contract Documents shall not relieve the Contractor of any of its responsibilities, duties and liabilities hereunder. The Contractor shall be solely responsible to the Fund for the acts or defaults of such subcontractors and of such subcontractors' officers, agents and employees, each of whom shall, for this purpose, be deemed to be the agent or employee of the Contractor to the extent of its subcontract.

(4) The Contractor shall be fully responsible for the administration, integration, coordination, direction and supervision of all of its subcontractors and of all work and it shall check all space requirements of the work and coordinate and adjust the same so that conflicts in space do not occur in the work being performed by it with its own employees and with the work being performed by its subcontractors and so that all equipment, piping, wiring, etc., can be installed, where possible, in the spaces allowed for same.

(5) No subcontractor shall be permitted to work at the site until: (a) it has furnished satisfactory evidence to the Consultant of the insurance required by law; (b) in the case of a Project involving a federal grant, it has furnished satisfactory evidence to the Consultant of the same type and amount of liability insurance as that required of the Contractor by Section 5.06 of the Agreement; and (c) except for subcontractors designated by the Fund pursuant to the provisions of the Information for Bidders, it has been approved by the Consultant.

(6) Within ten (10) working days after the Contractor receives payment from the Fund on account of a progress payment application for the percentage of the work done, it shall pay each of its subcontractors the sum contained in said payment for the percentage of said subcontractor's work, less the same amount retained therefrom by the Fund under the terms of the Contract Documents or in consequence of any legal proceedings or statutory liens, and less any amounts due the Contractor under the subcontract for work not performed or not properly or timely performed by the subcontractor. In the event any subcontractor is not paid by the Contractor, the former should immediately notify the Fund of such fact.

(7) The Contractor shall execute with each of its subcontractors and shall require all subcontractors to execute with their sub-subcontractors a written agreement which shall bind the latter to the terms and provisions of this Contract insofar as such terms and provisions are applicable to the work to be performed by such subcontractors. The Contractor shall require all subcontractors and sub-subcontractors to promptly, upon request, file with the Consultant and the Fund a conformed copy of such agreements, from which the price and terms of payment may be deleted.

(8) If for sufficient reason, at any time during the progress of the work to be performed hereunder, the Consultant determines that any subcontractor or sub-subcontractor is incompetent, careless, or uncooperative, the Consultant will notify the Contractor accordingly and immediate steps will be

taken by the Contractor for cancellation of such subcontract or sub-subcontract. Such termination, however, shall not give rise to any claim by the Contractor or by such subcontractor or sub-subcontractor for loss of prospective profits on work unperformed and/or work unfurnished and a provision to that effect shall be contained in all subcontracts and sub-subcontracts.

(9) No provisions of this Contract shall create or be construed as creating any contractual relation between the Fund and any subcontractor or sub-subcontractor or with any person, firm or corporation employed by, contracted with or whose services are utilized by the Contractor.

Section 2.19 Shop Drawings and Samples

(1) The Contractor in accordance with the approved Shop Drawing, Submittal, Mockup, and Sample schedules and with such promptness and in such sequence as to cause no delay in the work, shall submit for the Consultant's approval all Shop Drawings and Samples called for under the Contract or requested by the Consultant.

(2) Shop Drawings and mock-ups shall establish the actual detail of the work, indicate proper relation to adjoining work, amplify design details of mechanical and electrical equipment in proper relation to physical spaces in the structure, and incorporate minor changes of design or construction to suit actual conditions. Shop drawings include drawings, diagrams, schedules, product data and other information or materials specially prepared for the work by the Contractor to illustrate some portion of the work. Product data include standard illustrations, schedules, performance charts, instructions, brochures, diagrams and other information identified by the Contractor to illustrate materials or equipment for some portion of the work.

(3) All Shop Drawings, mock-ups and samples shall be thoroughly checked by the Contractor for compliance with the Contract Documents before submitting them to the Consultant for approval and all Shop Drawings shall bear the Contractor's recommendation for approval. Any Shop Drawings submitted without this stamp of approval and certification, and Shop Drawings which, in the Consultant's opinion, are incomplete, contain numerous errors or have not been checked or only checked superficially, will be returned unchecked by the Consultant for resubmission by the Contractor. In checking Shop Drawings, the Contractor shall verify all dimensions and field conditions and shall check and

coordinate the Shop Drawings of any section or trade with the requirements of all other sections or trades whose work is related thereto, as required for proper and complete installation and sequence of the work.

(4) Samples must be of sufficient size or number to show the quality, type, range of color, finish and texture of the material. Each Sample shall be properly labeled to show the nature of the material, trade name of manufacturer, name and location of the work where the material represented by the Sample is to be used and the name of the Contractor submitting the Sample. Transportation charges to the Consultant must be prepaid on Samples forwarded to it.

(5) At the start of the Project, the format for submittals shall be established by the Fund. If an electronic method is selected for the submission and approval of submittals, the Contractor shall provide submittals in a PDF format and the Consultant will return the submittals in electronic format to the Contractor. For both hard-copy and electronic submittal formats, all submittals that require physical samples or mock-ups shall be provided in accordance with the requirements set forth in the Contract Specifications. Shop Drawings and Samples, submitted by the Contractor in accordance with the approved Shop Drawing and Sample schedule that is included in the Time Progress Schedule, will be reviewed by the Consultant within fifteen (15) working days and if satisfactory will be approved. A Shop Drawing, when approved, will be returned to the Contractor. If not satisfactory, the Drawings and Samples will be appropriately marked and returned to the Contractor for correction thereof, in which event the Contractor shall resubmit to the Consultant a corrected copy of the Shop Drawing or a new Sample, as the case may be. The Contractor shall make any correction required by the Consultant and shall appropriately note any changes or revisions on the Shop Drawing, dated to correspond with the date of the Consultant's request for the change. Upon approval of the Shop Drawing by the Consultant, the Contractor shall promptly furnish to the Consultant as many copies thereof as the Consultant may reasonably request. Should more than two (2) separate reviews of any required shop drawings or samples submitted be necessary, in the judgement of the Consultant and the Fund, the Contractor shall be responsible for the reasonable costs incurred by the Fund for such additional reviews by the Consultant.

(6) At the time of submission of a Shop Drawing or Sample, the Contractor shall inform the Consultant and the Fund in writing of any deviation in the Shop Drawing or Sample from the requirements of the

Contract Documents. Unless such deviation is specifically noted by the Contractor with a notation that such deviation will result in extra work for which the Contractor requests payment, the Contractor shall be deemed to have waived any claim for extra work, additional compensation or payment or an extension of time with respect to all work shown on, described in or related to the Shop Drawing or Sample.

(7) The Consultant's approval of Shop Drawings or Samples is for design only and is not a complete check on the method of assembly, erection or construction. Approval shall in no way be construed as: (a) permitting any departure whatsoever from the Contract Documents, except where the Contractor, in accordance with the provisions of paragraph 6 of this Section, has previously notified the Fund and the Consultant of such departure; (b) relieving the Contractor of full responsibility for any error in quality of materials, details, dimensions, omissions or otherwise that may exist; (c) relieving the Contractor of full responsibility for adequate field connections, erection techniques, bracing or deficiencies in strength; (d) relieving the Contractor of full responsibility for satisfactory performance of all work and coordination with the work of all subcontractors and other contractors; or (e) permitting departure from additional details or instructions previously furnished by the Consultant.

(8) No work requiring a Shop Drawing or Sample shall be commenced until a Shop Drawing or Sample is approved by the Consultant and all such work shall be: (a) in accordance with the approved Shop Drawing, provided the latter conforms in all respects to the Contract Documents or to such deviations therefrom as have been previously noted by the Contractor in accordance with the provisions of paragraph 6 of this Section; and (b) in conformance in all respects to the sample furnished to and approved by the Consultant and, unless otherwise specified, as new and of good quality.

(9) The Contractor may be required to provide professional services that constitute the practice of architecture or engineering when specifically required by the Contract Documents for a portion of the work or the Contractor needs to provide such services in order to carry out its responsibilities for construction means, methods, techniques, sequences and procedures. When professional services are required in the Contract Documents, the Consultant will specify all performance and design criteria that such services must satisfy. The Fund and Consultant shall be entitled to rely on the adequacy, accuracy and completeness of the professional services,

certifications, and approvals performed or provided by design professionals working for the Contractor.

(10) Contractor agrees that the Fund may deduct from any application for payment made by the Contractor, any and all Design Professional, Consultant and/or Construction Management fees and costs incurred by the Fund together with a markup upon such hard costs in the amount of 15% in the review or evaluation of any substitutions for methods, products or performance pursuant to this Section 2.19.

Section 2.20 Equivalents - Approved Equal

(1) Equivalents or Approvals - General

a. The words "similar and equal to", or equal", “equivalent" and such other words of similar content and meaning shall for the purposes of this Contract be deemed to mean similar and equivalent to one of the named products. For the purposes of subdivisions (1) and (2) of this Section and for the purposes of the Bidding Documents, the word "products" shall be deemed to include the words “articles", "materials", "items", "equipment" and “methods". Whenever in the Contract Documents one or more products are specified, the words "similar and equal to" shall be deemed inserted.

b. Whenever any product is specified in the Contract Documents by a reference to the name, trade name, make or catalog number of any manufacturer or supplier, the intent is not to limit competition, but to establish a standard of quality which the Consultant has determined is necessary for the Project. A Contractor may at its option use any product other than that specified in the Contract Documents provided the same is approved by the Consultant in accordance with the procedures set forth in subdivision (2) of this Section except for the single/sole source shown in Specification Sections where the use of another product is not permitted. In all cases the Consultant shall be the sole judge as to whether a proposed product is to be approved and the Contractor shall have the burden of proving, at its own cost and expense, to the satisfaction of the Consultant, that the proposed product is similar and equal to the named product. In making such determination the Consultant may establish such objective and appearance criteria as it may deem proper that the proposed product must meet in order for it to be approved.

c. Nothing in the Contract Documents shall be construed as representing, expressly or implied, that the named product is available or that there is or there is not a product similar and equal to any of the named products and the Contractor shall have and make no claim by reason of the availability or lack of availability of the named product or of a product similar and equal to any named product.

d. The Contractor shall have and make no claim for an extension of time or for damages by reason of the time taken by the Consultant in considering a product proposed by the Contractor or by reason of the failure of the Consultant to approve a product proposed by the Contractor.

e. Requests for approval of proposed equivalents will be received by the Consultant only from the Contractor.

f. Approval shall in no way be construed as: (a) permitting any departure whatsoever from the Contract Documents, (b) relieving the Contractor of full responsibility for any error in quality of materials, details, dimensions, sequence of work, omissions or otherwise that may exist, (c) relieving the Contractor of full responsibility for adequate field connections, erection techniques, bracing or deficiencies in strength, (d) relieving the Contractor of full responsibility for satisfactory performance of all work to achieve a functionally complete facility or result and coordination with the work of all subcontractors and other contractors or (e) permitting departure from additional details or instructions previously furnished by the Consultant.

g. Contractor agrees that the Contractor approves and authorizes the deduction from Contractor's applications for payment any and all costs incurred by the Construction Manager, Consultant, Design Professional or otherwise in evaluating Contractor's submissions under this Section 2.20, together with a markup upon such hard costs in the amount of 15%.

(2) Equivalents or Approvals After Bidding

a. Any and all submissions for "or equal" products which are submitted by the Contractor after award of the Contract must be made by the Contractor within ninety (90) calendar days after the date of award. Contractor agrees that it waives and relinquishes the right, claim or privilege, if

any, to submit "or equal" proposals if such are made ninety (90) calendar days after the date of award of the Contract to the Contractor.

b. Requests for approval of proposed equivalents will be considered by the Consultant after bidding only in the following cases: (a) the named product cannot be obtained by the Contractor because of strikes, lockouts, bankruptcies or discontinuance of manufacture and the Contractor makes a written request to the Consultant for consideration of the proposed equivalent within ten (10) calendar days of the date it ascertains it cannot obtain the named product; or (b) the proposed equivalent is superior, in the opinion of the Consultant, to the named product; or (c) the proposed equivalent, in the opinion of the Consultant, is equal to the named product and its use is to the advantage of the Fund, e.g., the Fund receives an equitable credit, acceptable to it, as a result of the estimated cost savings to the Contractor from the use of the proposed equivalent or the Fund determines that the Contractor has not failed to act diligently in placing the necessary purchase orders and a savings in the time required for the completion of the construction of the Project should result from the use of the proposed equivalent.

c. Where the Consultant pursuant to the provisions of this subdivision approves a product proposed by a Contractor and such proposed product requires a revision or redesign of any part of the work covered by this Contract, all such revision and redesign and all new Drawings and details required therefor shall be subject to the approval of the Consultant and shall be provided by the Contractor at its own cost and expense.

d. Where the Consultant pursuant to the provisions of this Section approves a product proposed by a Contractor and such proposed product requires a different quantity and/or arrangement of duct work, piping, wiring, conduit or any other part of the work from that specified, detailed or indicated in the Contract Documents, the Contractor shall provide the same at its own cost and expense.

(3) Contractor agrees that the Fund may deduct from any application for payment made by the Contractor any and all Design Professional, Consultant and/or Construction Management fees and costs incurred by the Fund, together with a markup upon such hard costs in the amount of 15%, in the consideration or evaluation of any substitutions for methods, products or performance pursuant to this Section 2.20.

Section 2.21 Patents, Trademarks and Copyrights

The Contractor acknowledges that the Contract consideration includes all royalties, license fees and costs arising from patents or trademarks in any way involved in the work; provided, however, that the Contract consideration shall not be deemed to have included therein any royalty, license fee or cost arising from a patent or trademark for a design prepared by the Consultant and the Contractor shall have no liability in connection therewith. Where the Contractor is required or desires to use any product, device, material or process covered by patent or trademark, the Contractor shall indemnify and save harmless the Fund from any and all claims, actions, causes of action or demands, for infringement by reason of the use of such patented product, device, material or process, and shall indemnify the Fund from any cost, liability, damage and expense, including reasonable attorneys' fees and court costs, which it may be obligated to incur or pay by reason of any claim or infringement at any time both before or after the Fund's final acceptance of all the work to be performed under the Contract.

Section 2.22 Possession Prior to Completion

If before the final completion of all the work it shall be deemed advisable or necessary by the Fund to take over, use, occupy or operate any part of the completed or partly completed work or to place or install therein equipment and furnishings, the Fund, upon reasonable written notice to the Contractor, shall have the right to so do and the Contractor will not in any way interfere therewith or object to the same. Such action by the Fund shall in no way affect the obligations of the Contractor under the terms and provisions of the Contract Documents and the Contractor acknowledges that such action by the Fund does not in any way evidence the completion of the work or any part thereof or in any way signify the Fund's acceptance of the work or any part thereof. The Contractor agrees to continue the performance of all work covered by the Contract in a manner which will not unreasonably interfere with such takeover, use, occupancy, operation, placement or installation.

Section 2.23 Completion and Acceptance

(1) Partial Completion

If before the final completion of all the work any portion of the permanent construction has been satisfactorily completed and the same will be immediately useful to the Fund, the latter may, by written notice, advise the Contractor that it accepts such portion of the work. Such action by the Fund shall in no way affect the obligations of the Contractor under the terms and provisions of the Contract with respect to any work not so completed and accepted. The partial completion of any portion of the Contractor's work by the Fund, the Campus or the Consultant, shall not impact the assessment of liquidated damages or actual costs for delays or disruption to the Project caused by the Contractor, its subcontractors or vendors.

(2) Substantial Completion

When all the Work covered by the Contract is substantially completed, as defined in Section 1.01, the Contractor shall give written notice thereof to the Fund and the Consultant. The latter will then promptly make an inspection of the work and, if they shall determine that all the work is substantially completed, they shall so advise the Contractor. Such action shall in no way affect the obligations of the Contractor under the terms and provisions of the Contract with respect to any uncompleted (including untested or deferred work), unaccepted or corrective work or in any way affect, limit or preclude the issuance by the Consultant, from time to time thereafter, of "Punch Lists", i.e., lists of uncompleted or corrective work which the Contractor is to promptly complete and/or correct. In the judgement of the Fund, should more than two (2) separate inspections of the Work be necessary, the Contractor agrees that the Fund may deduct from any application for payment made by the Contractor, any and all Design Professional, Consultant and/or Construction Management fees and costs incurred by the Fund together with a markup upon such hard costs in the amount of 15% for all such additional inspections.

The Contractor must fully, completely and acceptably perform all Punch List work and any other work subsequently discovered remaining to be completed or corrected, within ninety (90) calendar days of Substantial Completion or within such other timeframe stipulated by the Fund or Consultant. Failure to complete the Punch List within the time so designated hereunder may be deemed default on the part of the Contractor.

(3) Final Completion and Acceptance

After the completion of all the work the Contractor shall give written notice to the Fund and the Consultant that all the work is ready for inspection and final acceptance. The Fund and the Consultant shall promptly make such inspection and, if they shall determine that all the work has been satisfactorily completed, the Fund shall thereupon by written notice advise the Contractor that it accepts such work. In the judgement of the Fund, should more than two (2) separate inspections of the Work be necessary, the Contractor agrees that the Fund may deduct from any application for payment made by the Contractor, any and all Design Professional, Consultant and/or Construction Management fees and costs incurred by the Fund together with a markup upon such hard costs in the amount of 15% for all such additional inspections.

Section 2.24 Record Drawings

(1) At the start of the Project, the format for Record Drawings shall be established by the Fund. Prior to acceptance by the Fund of all work covered by the Contract, the Contractor shall furnish to the Consultant one (1) set of current Contract Drawings on which the Contractor has recorded, using colored pencil for hard copy format or electronic editing tool in contrasting color for electronic format, in a neat and workmanlike manner, all instances where actual field construction differs from work as indicated on the Contract Drawings. These "Record". Drawings shall show the following information: (a) all significant changes in plans, sections, elevations and details, such as shifts in location of walls, doors, windows, stairs and the like made during construction; (b) all significant changes in foundations, columns, beams, openings, concrete reinforcing, lintels, concealed anchorages and "knock-out" panels made during construction; (c) final location of electric panels, final arrangement of electric circuits and any significant changes made in electrical design as a result of Change Orders, Field Orders or job conditions; (d) final location and arrangement of all mechanical equipment and major concealed plumbing, including, but not limited to, supply and circulating mains, vent stacks, sanitary and storm water drainage; (e) final location and arrangement of all underground utilities, connections to building and/or rerouting of existing utilities, including, but not limited to, sanitary, storm, heating, electric, signal, gas, water and telephone: and (f) final make and model for all significant equipment and devices listed in the specifications. The Contractor shall also provide an electronic version as determined by the Consultant.

(2) Periodically during the work, the Consultant may request submission of a progress set of Record Drawings for review and advise the Contractor of errors or omissions, if any, that must be corrected or completed prior to final submission of the Record Drawings. Shop Drawings shall not be acceptable as Record Drawings.

(3) The Contractor shall submit the Record Drawings to the Consultant at least fifteen (15) days prior to the date of Substantial Completion. The Consultant will then review the Record Drawings and, if they shall determine that the Record Drawings represent the actual field construction being completed, they shall so advise the Contractor. If not satisfactory, the Record Drawings will be appropriately marked and returned to the Contractor for correction thereof, in which event the Contractor shall promptly correct and resubmit to the Consultant a corrected copy of the Record Drawings. Acceptance of the Record Drawings by the Fund is a condition precedent to the Contractor's entitlement to receive Final Payment.

Section 2.25 Guarantees

(1) The Contractor, at the convenience of the Fund, shall remove, replace and/or repair at its own cost and expense any defects in workmanship, materials, ratings, capacities or characteristics occurring in or to the work covered by the Contract within one (1) year or within such longer period as may otherwise be provided in the Contract, the period of such guarantee to commence with the Fund's final acceptance of all work covered under the Contract or at such other date or dates as the Fund may specify prior to that time, and the Contractor, upon demand, shall pay for all damage to all other work resulting from such defects and all expenses necessary to remove, replace and/or repair such other work which may be damaged in removing, replacing or repairing the said defects. The obligations of the Contractor under the provisions of this paragraph or any other guarantee provisions of the Contract Documents are not limited to the monies retained by the Fund under the Contract.

(2) Unless such removal, replacement and/or repair shall be performed by the Contractor within ten
(10) working days after it receives written notice from the Fund specifying such defect, or if such defect is of such a nature that it cannot be completely removed, repaired and/or replaced within said ten (10) day period and the Contractor shall not have diligently commenced removing, repairing and/or replacing such defect within said ten (10) day period and shall not thereafter with reasonable diligence and in good

faith proceed to do such work, the Fund may employ such other person, firm or corporation as it may choose to perform such removal, replacement and/or repair and the Contractor agrees, upon demand, to pay to the Fund all amounts which it expends for such work.

Section 2.26 Default of Contractor

(1) In addition to those instances specifically referred to in other Sections hereof, the Fund shall have the right to declare the Contractor in default of the whole or any part of the work if:

a. The Contractor becomes insolvent; or if

b. The Contractor makes an assignment for the benefit of creditors pursuant to the statutes of the State of New York; or if

c. A voluntary or involuntary petition in bankruptcy is filed by or against the Contractor; or if

d. A receiver or receivers are appointed to take charge of the Contractor's property or affairs; or if

e. The Contractor fails to commence work when notified to do so by the Consultant; or if

f. The Contractor shall abandon the work; or if

g. The Contractor shall refuse to proceed with the Work or extra Work when and as directed by the Consultant or Fund; or if

h. The Contractor shall without just cause reduce its working force to a number which, if maintained, would be insufficient, in the opinion of the Fund, to complete the work in accordance with the approved time progress schedule, and shall fail or refuse to sufficiently increase such working force when ordered to do so by the Consultant; or if

i. The Contractor shall sublet, assign, transfer convey, or otherwise dispose of the Contract other than as herein specified; or if

j. The Fund shall be of the opinion that the Contractor is or has been unnecessarily or unreasonably or willfully delaying the performance and completion of the work, or the award of necessary subcontracts, or the placing of necessary material and equipment orders; or if

k. The Fund shall be of the opinion that the work cannot be completed within the time herein

provided therefor or within the time to which such completion may have been extended; provided, however, that the impossibility of timely completion is, in the Fund's opinion, attributable to conditions within the Contractor's control; or if

l. The work is not completed within the time herein provided therefor or within the time to which the Contractor may be entitled to have such completion extended; or if

m. The Fund shall be of the opinion that the Contractor is or has been willfully or in bad faith violating any of the provisions of this Contract;

n. The Fund shall be of the opinion that the Contractor is not or has not been executing the Contract in good faith and in accordance with its terms; or if

o. At any time during the period of the Agreement, insurance as required is not in effect or proof thereof is not provided to the Fund.

(2) Before the Fund shall exercise its right to declare the Contractor in default by reason of the conditions set forth in the above items *a, b, c, d, e, f, g, h, j, k, l,* m, n and o, it shall give the Contractor three
(3) working days' notice of its intention to declare the Contractor in default and unless, within such three (3) day period, the Contractor shall make arrangements, satisfactory to the Fund, to correct and/or eliminate the conditions set forth in the Fund's aforesaid notice, the Contractor may be declared in default at the expiration of such three (3) day period or at the expiration of such longer period of time as the Fund may determine.

(3) The right to declare in default for any of the grounds specified or referred to shall be exercised by the Fund sending the Contractor a written notice setting forth the ground or grounds upon which such default is declared. Upon receipt of notice that it has been declared in default, the Contractor shall immediately discontinue all further operations under the Contract and shall immediately quit the site, leaving untouched all plant, materials, equipment, tools and supplies then on site.

(4) The Fund, after declaring the Contractor in default, may then have the work completed by such means and in such manner, by contract, with or without public letting, or otherwise, as it may deem advisable, utilizing for such purpose such of the Contractor's plant, materials, equipment, tools and supplies remaining on the site, and also such subcontractors as it may deem advisable, or it may call

upon the Contractor's surety at its own expense to do so.

(5) In the event that the Fund declared the Contractor in default of the work or any part of the work, the Contractor, in addition to any other liability to the Fund hereunder or otherwise provided for or allowed by law, shall be liable to the Fund for any costs it incurs for additional architectural and engineering services necessary, in its opinion, because of the default and the total amount of liquidated damages from the date when the work should have been completed by the Contractor in accordance with the terms hereof to the date of actual completion of the work, both of which items shall be considered as expenses incurred by the Fund in completing the work and the amount of which may be charged against and deducted out of such monies as would have been payable to the Contractor or its surety if the work had been completed without a default.

(6) If the Fund completes the work, the Consultant shall issue a certificate stating the expenses incurred in such completion, including the cost of re-letting. Such certificate shall be final, binding and conclusive upon the Contractor, its surety, and any person claiming under or through the Contractor, as to the amount thereof.

(7) The expense of such completion, as so certified by the Consultant, shall be charged against and deducted out of such monies as would have been payable to the Contractor if it had completed the work; the balance of such monies, if any, subject to the other provisions of the Contract, to be paid to the Contractor without interest after such completion. Should the expense of such completion, so certified by the Consultant, exceed the total sum which would have been payable under the Contract if the same had been completed by the Contractor, any such excess shall be paid by the Contractor to the Fund upon demand.

(8) In the event the Fund shall determine to complete the work without calling upon the Contractor's surety to do so, the Contractor shall not be entitled, from and after the effective date of the declaration of the default, to receive any further payment under the Contract until the said work shall be wholly completed and accepted by the Fund.

(9) In case the Fund shall declare the Contractor in default as to a part of the work only, the Contractor shall discontinue such part, shall continue performing the remainder of the work in strict conformity with the terms of the Contract, and shall in no way hinder or interfere with any other contractors or persons whom

the Fund may engage to complete the work as to which the Contractor was declared in default.

(10) The provisions relating to declaring the Contractor in default as to the entire work shall be equally applicable to a declaration of partial default, except that the Fund shall be entitled to utilize for completion of the part of the work as to which the Contractor was declared in default only such plant, materials, equipment, tools and supplies as had been previously used by the Contractor on such part.

(11) In completing the whole or any part of the work, the Consultant and the Fund shall have the power to depart from, change or vary the terms and provisions of the Contract; provided, however, that such departure, change or variation is made for the purpose of reducing the time or expense of such completion. Such departure, change or variations, even to the extent of accepting a lesser or different performance, shall not affect the conclusiveness of the Consultant's certificate of the cost of completion, nor shall it constitute a defense to any action to recover the amount by which such certificate exceeds the amount which would have been payable to the Contractor hereunder but for its default.

(12) The provisions of this Section shall be in addition to any and all other legal or equitable remedies provided by this Agreement and otherwise applicable by law.

Section 2.27 Termination for Convenience

(1) The performance of work under this Contract may be terminated by the Fund, in whole or in part, whenever the Fund shall determine that such termination is in the best interest of the Fund. Any such termination shall be effected by a notice in writing to the Contractor specifying the date upon which such termination shall become effective and the extent to which performance of the Contract shall be terminated. Such termination shall be effective on the date and to the extent specified in said notice.

(2) Upon receipt of a notice of termination, and-except as otherwise directed in writing by the Fund, the Contractor shall:

a. Discontinue all work and the placing of all orders for materials and facilities otherwise required for the performance thereof,

b. Cancel all existing orders and subcontracts to the extent such orders and subcontracts relate to the

performance of work terminated by the notice of termination;

c. Take such action as may be necessary to secure to the Fund the benefits of any rights of the Contractor under orders or subcontracts which relate to the performance of work terminated by the notice of termination, including, but not limited to, the assignment to the Fund, in the manner and to the extent directed by the Fund, all the right, title and interest of the Contractor under the orders or subcontracts so terminated and cancelled. In the event of such assignment, the Fund shall have the right, in its discretion, to settle or pay any or all claims arising out of the termination and cancellation of such orders and subcontracts;

d. Transfer title and deliver to the Fund, in accordance with the direction of the Fund, all materials, supplies, work in process, facilities, equipment, machines or tools produced as a part of or acquired by the Contractor in connection with the work terminated by said notice, and all plans, Drawings, Working Drawings, sketches, Specifications and information for use in connection therewith; provided, however, that the Contractor may retain any of the foregoing if it so elects and foregoes reimbursement therefor;

e. Take such action as may be necessary or as the Consultant or the Fund may prescribe for the protection and preservation of all property in the possession or control of the Contractor in which the Fund, under the provisions of the Contract, has or may acquire an interest.

(3) Notwithstanding the foregoing, should the notice of termination relate to only a portion of the work covered by the Contract, the Contractor will proceed with the completion of such portions of the work as are not terminated.

(4) The Fund will pay and the Contractor shall accept, in full consideration for the performance and completion of the portions of the work as are not terminated, a sum calculated by determining the percentage the portions of the work not terminated bear to the total amount of the work covered by the Contract, and by multiplying the Contract consideration by such percentage - the product thereof being the amount to be paid to the Contractor. The Fund shall determine the amount of such consideration in accordance with the foregoing.

(5) Upon compliance by the Contractor with the foregoing provisions of this Section and subject to

deductions for payments previously made, the Fund, for the portions of the work terminated, shall compensate the Contractor as follows:

a. By reimbursing the Contractor for actual expenditures made with respect to such work, including expenditures made in connection with any portion thereof which may have been completed prior to termination, as well as expenditures made after termination in completing those portions of the work covered by the Contract which the Contractor may have been required by the notice of termination to complete. The Fund shall determine the allowability and amount of such expenditures.

b. By reimbursing the Contractor for all actual expenditures made, with the prior written approval of the Fund or pursuant to a court judgment, in settling or discharging any outstanding contractual obligations or commitments incurred or entered into by the Contractor in good faith with respect to the Contract and resulting from the termination thereof.

c. By reimbursing the Contractor for all actual expenditures made after the effective date of the notice of termination resulting from or caused by the Contractor taking necessary action or action prescribed by the Consultant or the Fund for the protection and preservation of all property in the possession or control of the Contractor in which the Fund, under the provisions of the Contract, has or may acquire an interest.

d. By paying the Contractor a markup, which is to be calculated in the same manner as that provided for in subdivision c of paragraph (1) of Sections 4.02 and 4.05A for extra work, on the foregoing expenditures, which markup is to cover the Contractor's overhead and profit; provided, however, that if it appears that the Contractor would have sustained a loss on the entire Contract had it been completed, said markup shall be reduced by one-third.

(6) The sum of all amounts payable under this Section, plus the sum of all amounts previously paid by the Fund under the provisions of the Contract, shall not exceed the amount of the Contract consideration. In no event shall the Contractor be entitled to any payment for loss of anticipated profits on uncompleted work and the Fund shall not be liable for same.

(7) Termination by the Fund under the provisions of this Section shall be without prejudice to any claims

or rights which the Fund may have against the Contractor. The Fund may retain from the amount due to the Contractor under the provisions of this Section such monies as may be necessary to satisfy any claim which the Fund may have against the Contractor in connection with the Contract; provided, however, that the Fund's failure to retain such monies shall not be deemed a waiver of any of its rights or claims against the Contractor.

(8) Notwithstanding the foregoing, where the Contractor and the Consultant can agree upon another method of determining the amount of the consideration to be paid to the Contractor under the provisions of this Section, such method, subject to the approval of the Fund, may, at the option of the Fund, be substituted for the method set forth above.

Article III
Time of Performance

Section 3.01 Commencement, Prosecution and Completion of Work

(1) The Contractor agrees that it will begin the work herein embraced upon receipt of the Notice to Proceed, unless the Fund consents, in writing, to begin at a different date, and that it will prosecute the same with such diligence that all work covered by the Contract shall be substantially completed and performed on or before the time specified on page A-1 of the Agreement.

(2) The Contractor further agrees that time is of the essence in this Contract and that all the Work shall be prosecuted in such manner and with sufficient plant and forces to complete all Work timely.

Section 3.02 Time Progress Schedule

(1) To show compliance with the requirements of Section 3.01 of the Agreement, provide and maintain a Time Progress Schedule in accordance with the General Requirements, Special Conditions, Section paragraph titled “Project Schedule”. Unless otherwise accepted by the Fund, the Time Progress Schedule shall be strictly adhered to by the Contractor. The time for substantial completion shall be on or before the time specified on page A-1 of the Agreement.

(2) If through the fault of the Contractor or any subcontractor the Contractor shall fail to adhere to the time progress schedule, it must promptly adopt such other and additional means and methods of construction as will make up for the time lost and will assure completion in accordance with such schedule.

(3) The failure of the Contractor to submit a Time Progress Schedule, the Fund's or the Consultant's acceptance of the Contractor's time progress schedule or lack of such acceptance, the means and/or methods of construction employed by the Contractor, including any revisions thereof, and/or its failure to revise the same shall not relieve the Contractor of its obligation to accomplish the result required by the Contract in the time specified on page A-1 of the Agreement, nor shall the exercise of the Consultant's or the Fund's right to reject any portion of the work, create or give rise to any claim, action or cause of action, legal, equitable or otherwise, against the Consultant or the Fund.

(4) The failure of the Contractor to submit and maintain a Time Progress Schedule in accordance with the General Requirements shall be deemed to be a waiver by the Contractor of all claims for additional compensation or damages as a result of any condition which is an alleged cause of delay in the completion of the work.

Section 3.03 Time Progress Schedule for Shop Drawings and Samples

The Contractor shall include activities for preparation and submission of all Shop Drawings, mock-ups and Samples in the Time Progress Schedule in Section 3.02.

Section 3.04 Notice of Conditions Causing Delay

(1) Within ten (10) working days after the commencement of any condition which is causing or may cause delay in completion or require Contractor to request an extension of time, the Contractor must notify the Consultant and the Fund in writing of the effect, if any, of such condition upon the Time Progress Schedule, and must state why and in what respects, if any, the condition is causing or may cause such delay.

(2) Contractor agrees that an express condition precedent to Contractor's entitlement to any extension of time on the project shall be full and complete compliance to the satisfaction of the Fund with the Contractor's obligations in Section 3.06, Contractor's Progress Reports. Failure to submit proper Contractor's progress reports in appropriate and timely fashion shall be deemed a waiver and relinquishment of any right, claim or privilege to obtain an extension of time for the performance of the Contractor's work.

(3) Failure to strictly comply with this requirement may, in the discretion of the Fund, be deemed sufficient cause to deny any extension of time on account of delay in completion arising out of or resulting from any change, extra work, suspension, or other condition.

(4) Except as otherwise set forth in this Section 3.04 all procedures set forth in Sections 2.02 and 2.03 of this Agreement shall be complied with by the Contractor. Furthermore, full and complete compliance with the requirements of this Article III is a condition precedent to the Contractor's entitlement to receive an extension of time.

Section 3.05 Extension of Time

(1) Within ten (10) working days after the commencement of any condition which is causing or may cause the Contractor to incur, require or otherwise need an extension of time, the Contractor shall notify the Consultant and the Fund of such condition. Full and complete compliance with this paragraph 3.05(1) is a condition precedent to the Contractor obtaining an extension of time for performance of any portion or all of its work.

(2) An extension or extensions of time for the completion of the work may be granted by the Fund subject to the provisions of this Section, but only upon written application therefor by the Contractor to the Fund and the Consultant.

(3) An application for an extension of time must set forth in detail the source and the nature of each alleged cause of delay in the completion of the work, the date upon which each such cause of delay began and ended and the number of days of delay attributable to each of such causes. It must be submitted prior to completion of the work.

(4) If such an application is made, the Contractor may be entitled to an extension of time for delay in completion of the work caused solely: (a) by the acts or omissions of the Fund, its trustees, officers, agents or employees; or (b) by the acts or omissions of other contractors, not including subcontractors of the Contractor, on this Project; or (c) by unforeseeable supervening conditions entirely beyond the control of either party hereto (such as, but not limited to, acts of God or the public enemy, war or other national emergency making performance temporarily impossible or illegal, or strikes or labor disputes).

(5) The Contractor may, however, be entitled to an extension of time for such causes only for the

number of calendar days of delay which the Fund may determine to be due solely to such causes, and then only if the Contractor shall have strictly complied with all of the requirements of this Section and Section
3.04. The Fund shall make such determination within ninety (90) calendar days after receipt of the Contractor's application for an extension of time; provided, however, said application complies with the requirements of this Section.

(6) The Contractor shall not be entitled to receive a separate extension of time for each one of several causes of delay operating concurrently, but, if at all, only for the actual period of delay in completion of the work as determined by the Fund, irrespective of the number of causes contributing to produce such delay. If one of several causes of delay operating concurrently results from any act, fault or omission of the Contractor or of its subcontractors or material-men and would of itself (irrespective of the concurrent causes) have delayed the work, no extension of time will be allowed for the period of delay resulting from such an act, fault or omission.

(7) The granting of an application for an extension of time for causes of delay other than those herein referred to shall be entirely within the discretion of the Fund.

(8) If the Contractor shall claim to have sustained any damages by reason of delays, extraordinary or otherwise, or hindrances which it claims to be due to any action, omission, direction or order by the Fund or the Consultant, the Contractor shall be entitled only to an extension of time as hereinabove provided and shall not have or assert any claim or prosecute any suit, action, cause of action or proceeding against the Fund based upon such delays or hindrances, unless such delays or hindrances were caused by the Fund's bad faith or its willful, malicious, or grossly negligent conduct, or uncontemplated delays, or delays so unreasonable that they constitute an intentional abandonment of the Contract by the Fund, or delays resulting from the Fund's breach of a fundamental obligation of the Contract.

(9) The Contractor shall not be entitled to an extension of time for the performance of any or all of the Work set forth in allowances to the Contract. All allowance work shall be performed in accordance with the Contractor's schedule.

Section 3.06 Contractor's Progress Reports

After commencement of the work the Contractor shall furnish the Consultant with written monthly reports

setting forth the condition and progress of the work, the percentage of each part of the work that has been finished, those parts of the work which have been completed within the scheduled time and those parts of the work which have not been finished within the scheduled time, and the general progress of the work that is being performed away from the site and the approximate date when such work will be finished and delivered to the site. Contractor agrees that compliance with this Section 3.06 is an express condition precedent to the Contractor's right, claim or entitlement to obtain an extension of time for the performance of the Contractor's work. Failure to comply with this Section 3.06 shall be a waiver and relinquishment of all such rights, claims and privileges to request or obtain an extension of time for the performance of Contractor's work.

Article IV
Payment

Section 4.01 Compensation to Be Paid Contractor

The Fund shall pay to the Contractor and the latter shall accept as full and complete payment for the performance of this Contract, subject to additions or deductions as provided herein, the sum of
which sum is the amount of the Contract consideration.

Section 4.02 Value of Omitted and Extra Work

(1) The amount by which the Contract consideration is to be increased or decreased by any Change Order or Field Order shall be determined by the Fund by one or more of the following methods:

a. By applying the applicable price or prices set forth on the attached Schedule "I" of this Agreement or by applying a unit price agreed to by both parties. Subject to the provisions of Section 4.04, this method must be used if the Contract Documents contain applicable unit prices.

b. By estimating the fair and reasonable cost of: (i) labor, including all wages, required wage supplements and insurance required by law (workers' compensation, social security, disability, unemployment, etc.) paid to or on behalf of foremen, workers and other employees below the rank of superintendent directly employed at the site of the Project; (ii) materials; and (iii) equipment, excluding hand tools, which, in the judgment of the Fund, would have been or will be employed exclusively and directly on the omitted

work or extra work, as the case may be; and, in the case of extra work, where the same is performed directly by the Contractor, by adding to the total of such estimated costs a sum equal to 15 percent thereof, but, where the extra work is performed by a subcontractor, by adding a sum equal to 15 percent of said costs for the benefit of such subcontractor, and by adding, for the benefit of the Contractor (no further allowance will be made where extra work is performed by the sub- subcontractor), an additional sum equal to 10 percent of the first $10,000 of the above-estimated costs, including the subcontractor's percentage override, plus 5 percent of the next $90,000 of the total of said items, plus 3 percent of any sum in excess of $100,000 of the total of said items. There is no markup on the premium portion of overtime labor. For the purposes of the aforesaid percentage overrides, the words "extra work" shall be defined as a complete item of added, modified or changed work as described in the Consultant's written instructions to the Contractor. Such "extra work" may include the work of one or more trades and/or subcontractors or sub-subcontractors and shall include all labor, materials, plant, equipment, tools and all incidentals directly and/or indirectly necessary, related, involved in or convenient to the successful completion of the extra work item. Where the Consultant's aforesaid written instructions to the Contractor involve both an increase and a reduction in similar or related work, the above percentage overrides will be applied only on the amount, if any, the cost of the increased work exceeds the cost of the reduced work.

No overhead and profit shall be retained by the Contractor on the cost of work determined by the method provided in Subparagraph (1)a.

All profit, overhead and expense of whatsoever kind and nature, other than those set forth above in items (i) through (iii), of the Contractor, its subcontractors and sub-subcontractors, are covered by the aforesaid percentage overrides and no additional payment therefor will be made by the Fund.

The Fund may make such cost estimate either before or after the extra work is completed by the Contractor.

c. By determining the actual cost of the extra work in the same manner as in the above subdivision b except that actual costs of the Contractor shall be utilized in lieu of estimated costs. The Fund shall

have the option to utilize this method provided it notifies the Contractor of its intent to do so prior to the time the Contractor commences performance of such extra work.

(2) Irrespective of the method used or to be used by the Fund in determining the value of a Change Order or Field Order, the Contractor, within fifteen (15) working days after a request for the same, must submit to the Fund and the Consultant a detailed breakdown of the Contractor's estimate of the value of the omitted and/or extra work. All change and field orders must be prepared and submitted using the Fund's Open Item Log (OIL) System.

(3) Equipment Watch Rental Rate Blue Book (published online by Intertec Penton Media, Inc.) or other published rates as approved by the Fund in writing, will be utilized for the equipment rental pricing. For the purposes of paragraph (1) hereof, the cost of equipment shall be determined, irrespective of the actual price for any rental or actual cost associated with such equipment as follows: take the monthly rate listed in Equipment Watch and dividing the same by 176 hours to establish an hourly rate and then multiplying such hourly rate by the actual number of hours that the equipment was used. The Contractor will submit an actual rental invoice, or acceptable quotation from a bonafide equipment rental supplier for rented equipment when equipment is not owned by the Contractor. The equipment rental supplier cannot be an "affiliate" of the Contractor, nor in any way be related to the Contractor. If submitted invoices/quotations are acceptable to the Fund, the Contractor will be reimbursed the actual rental cost including sales tax and appropriate mark-up. If no listing of rates for an item of equipment is contained in Equipment Watch, the Fund shall determine the reasonable rate of rental of the particular item of equipment by such other means as it finds appropriate. The edition Equipment Watch to be used shall be that in effect on the date of the receipt of bids for this Contract. None of the provisions of Equipment Watch shall be deemed referred to or included in this Contract excepting only the aforesaid monthly rates. To the cost of equipment as determined above, there is to be added the actual cost of gasoline, oil, grease and maintenance required for operation of such equipment and, in the case of equipment utilized only for extra work when, in the opinion of the Consultant, suitable equipment therefor was not available on the site, the reasonable cost of transporting said equipment to and from the site. Notwithstanding the foregoing, if the Consultant should determine that the nature or size of the equipment used by the Contractor in connection with the extra work is larger or more

elaborate, as the case may be, than the size or nature of the minimum equipment determined by the Consultant to be suitable for the extra work, the cost of equipment will not be based upon the equipment used by the Contractor but instead will be based on the smallest or least elaborate equipment determined by the Consultant to have been suitable for the performance of the extra work.

(4) Unless otherwise specifically provided for in a Change Order or Field Order, the compensation specified therein for extra work includes full payment for both the extra work covered thereby and for any damage or expense caused the Contractor by any delays to other work to be done under the Contract resulting from or on account of said extra work, and the Contractor waives all rights to any other compensation for said extra work, damage or expense.

Section 4.03 Adjustment for Bond and Insurance Premiums

Upon final acceptance of the work to be performed under this Contract, the Fund may adjust the Contract consideration to reflect any changes in the cost of all required Bonds and liability and builder's risk insurance premiums which the Contractor had to pay for on all extra work and would have had to furnish and pay for on all omitted work. Unless such cost is agreed upon by the Fund and the Contractor, the Fund may calculate and determine the amount of the adjustment in the Contract consideration by estimating such costs. There is no markup on bond or insurance premium adjustment.

Section 4.04 Unit Prices

(1) Except as otherwise provided in the second paragraph of this Section, the unit prices, set forth on the attached Schedule "I" of this Agreement, will be binding upon both the Fund and the Contractor in determining the value of omitted and/or extra work, and, in the case of extra work, such unit prices shall be deemed to include all profit, overhead and expenses of whatsoever kind and nature of the Contractor, its subcontractors and sub-subcontractors, and the Contractor agrees that it shall make no claim for any profit, overhead, expense or percentage override in connection therewith.

(2) Where said Schedule "I" sets forth a unit price for added and/or deducted work, the Fund shall have the option, whenever it is found that the quantity of changed work varies by more than 15 percent from the quantity that is stated or that can be determined by the

Contract Documents at the time of execution thereof, to accept or reject such unit price for the quantity that the changed work varies by more than 15 percent from the stated or determinable quantity. Where a quantity is not specifically stated in the Contract Documents, the Fund's determination of the amount of said quantity included in the Contract Documents shall determine the applicability of this paragraph. Where the Fund, pursuant to the foregoing provisions, exercises its aforesaid option, the amount of the increase or decrease in the Contract consideration for the quantity of work which varies by more than 15 percent from the stated or determinable quantity shall be determined in accordance with the provisions of Section 4.02 of the Agreement as if there was no unit price therefor set forth in said Schedule "I".

Section 4.05 Allowances

(1) The Contractor acknowledges that the Contract consideration includes the allowances set forth on the attached Schedule "II" and “III” of this Agreement and, except for quantitative and field order allowances, it agrees to cause the work covered thereby to be done by such contractors for such sums as the Fund may direct. Where cash allowances are provided, the allowances shall be deemed to include the purchase of the materials and/or equipment and the delivery of same to the job site. Unless otherwise specified in the Contract Documents, cash allowances do not include the proper installation of the materials and/or equipment or the connection for final utilities thereto; the cost of said installation and/or connection having been included in the amount of the Contract consideration.

(2) The Contractor acknowledges that the Contract consideration includes such sums for expenses and profit on account of cash allowances as it deems proper and that it shall make no claim for expenses or profit or any percentage override in addition thereto; said items having been included in the amount of the Contract consideration.

(3) In the event any of the cash allowances listed below are either higher or lower than the cost of having the work done in accordance herewith, the Contract consideration shall be adjusted to reflect such variance, the amount of said adjustment to be the difference between the amount of the allowance and the actual cost of performing the work covered thereby.

(4) When quantitative allowances are provided, progress payments thereof to the Contractor will be based upon the applicable unit prices set forth on the

attached Schedule "I" of the Agreement, subject, however, to the provisions of paragraph (2) of Section
4.04. In the event any of said quantitative allowances are more than or less than the actual quantity of work performed, the Contract consideration shall be adjusted to reflect such variance, the amount of said adjustment to be determined in accordance with the provisions of Sections 4.02, 4.04 and 4.05A of the Agreement.

Section 4.05A Field Orders

When the Agreement contains a Field Order Allowance, the bid shall include the amount of such allowance. Said amount shall cover the cost of additional labor, materials and time for contingent activities within the scope of the Agreement as directed and described by the Fund in writing in a Field Order. The Field Order will include a description of the work and the method for determining the value of such work. The value of the work directed under this allowance will be determined by one or more of the provisions of Section 4.02. If the net cost(s) of all Field Orders issued are more or less than the specified amount of the allowance, the Contract sum will be adjusted by Change Order.

Section 4.06 Deductions for Unperformed and/or Uncorrected Work

(1) Without prejudice to any other rights, remedies or claims of the Fund, in the event that the Contractor at any time fails or neglects to supply working forces and materials of the proper quantity and quality necessary, in the opinion of the Consultant or the Fund, to comply with the approved time progress schedule, or fails in any respect to prosecute the work with promptness and diligence or causes by any action or omission the stoppage or delay of or interference with the work of any other contractor having a contract with the Fund, or fails in the performance of any obligations and responsibilities under this Contract, then, and in that event, the Fund, acting itself or through the Consultant, may, upon three (3) working days' notice to the Contractor, either itself provide or have any other contractor, including but limited to the Fund's Job Order Contracting Program, provide any and all labor or materials or both necessary, in its opinion, to correct any aforesaid deficiency of the Contractor, and the Fund will thereafter backcharge the Contractor by issuing a Change Order reducing the amount of the Contract consideration for all costs and expenses it incurs in connection with the correction of such deficiency. The Contractor agrees that the Fund may deduct from any application for payment made by the Contractor, any

and all Design Professional, Consultant and/or Construction Management fees and costs incurred by the Fund together with a markup upon such hard costs in the amount of 15% for services required in connection with the correction of such deficiency(ies).

(2) Notwithstanding any provisions in the Contract Documents to the contrary, if the Fund deems it inexpedient to correct work not done in accordance with the Contract or any work damaged as a result thereof, it shall notify the Contractor of such fact and the latter shall not remedy or correct the same. In such event, however, the amount of the Contract consideration shall be decreased by an amount, determined by the Fund, which is equal to the difference in value of the work as performed by the Contractor and the value of the work had it been satisfactorily performed in accordance with the Contract or which is equal to the cost of performing the corrective work, whichever shall be the higher amount.

Section 4.07 Liquidated Damages

In the event that the Contractor shall fail to substantially complete all the work within the time fixed for such completion on page A-1, or within the time to which such completion may have been extended or in the event that the Contractor abandons the work and the same is not substantially completed within the aforesaid time for such completion, the Contractor must pay to the Fund as damages for each calendar day of delay in completing the work the amount set forth on page A-1. In view of the difficulty of accurately ascertaining the loss which the Fund will suffer by reason of delay in completion of the work hereunder, said sum is hereby fixed and agreed as liquidated damages which the Fund will suffer by reason of such delay and not as a penalty. The Fund may deduct and retain out of the monies which may become due hereunder to the Contractor the amount of any such liquidated damages and, in case the amount which may become due to the Contractor under the provisions of the Contract may be less than the liquidated damages suffered by the Fund, the Contractor shall pay the difference, upon demand, to the Fund.

Section 4.08 Contract Breakdown

Prior to the submission of its first application for a progress payment, the Contractor shall present to the Fund and the Consultant for their approval a detailed schedule showing the breakdown of the Contract consideration. The Contract Breakdown Summary shall be further broken down on separate Fund provided forms as required by the Consultant and the

Fund. Contract Breakdown Summary and supporting forms shall be able to interface with the Fund's electronic payment system. Such schedule must contain the amount estimated for each part of the work and quantity survey for each part of the work. It shall also list the estimated value of the Contractor's guarantee obligations under the provisions of the Contract Documents, which is hereby fixed at $5,000 or one-half of one percent (1/2%) of the Contract award amount, whichever is the lesser sum. Such schedule shall be revised by the Contractor until the same shall be satisfactory to the Fund and the Consultant and shall not be changed after the Fund and the Consultant have approved the same. The amounts set forth in the schedule will not be considered as fixing the basis for additions to or deductions from the Contract consideration.

Section 4.09 Prompt Payment Requirements

(1) For the purposes of Article XI-A of the State Finance Law, the Controller's Office of the State University Construction Fund, whose mailing address is The H. Carl McCall SUNY Building, 353 Broadway, Albany, New York 12246, is the Fund's designated payment office. Applications for payment must contain the approval of the Consultant before being submitted to the Fund.

(2) Whenever the Consultant's approval of an application for payment is required under the Contract, the Consultant shall have fifteen (15) calendar days, after receipt of such application, to inspect the work before acting on the application.

(3) Until such time that the Contract is approved by the Fund, the thirty (30) day period, referred to in Article XI-A of the State Finance Law for the payment of invoices without interest, shall not begin.

Section 4.10 Progress Payments

(1) Unless otherwise provided in the Contract, progress payments will be made as the work progresses upon applications submitted by the Contractor and approved by the Consultant and the Fund. Payment of such approved applications shall be made by the Fund within thirty (30) days after such approval has been given.

(2) The Fund shall make progress payments to the Contractor on the basis of such approved applications, less an amount equal to 5 percent thereof, plus an amount necessary, in the Fund's judgment, to satisfy any claims, liens or judgments against the Contractor which have not been suitably

discharged, , together with any back charges and offsets which are deemed necessary or likely to be incurred by the Fund as a result of any failure by the Contractor to fully, completely, accurately and timely perform its work, which it shall reserve from each such payment until all of the work covered by the Contract has been completed.

(3) When the Fund and the Consultant have determined that all the work is substantially completed, or that a substantial portion of the permanent construction has been completed and accepted, the Fund shall make a progress payment to the Contractor, on the basis of an application submitted by the Contractor and approved by the Consultant and the Fund, which shall reduce the unpaid amount due to the Contractor under the terms of the Contract, including all monies retained by the Fund from previous progress payments to the Contractor, to an amount equal to two (2) times the cost, estimated by the Consultant, of performing, in accordance with the Contract, all uncompleted, unaccepted and corrective work, plus an amount necessary, in the Fund's judgment, to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged. As the remaining items of work are satisfactorily completed or corrected, the Fund shall make progress payments to the Contractor, on the basis of applications submitted by the Contractor and approved by the Fund and the Consultant, covering said items of work less an amount necessary, in the Fund's judgment, to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged.

Section 4.11 Applications for Progress Payments

The Contractor shall prepare all applications for progress payments for work performed, together with supporting data and computations as are deemed necessary by the Consultant to determine the accuracy of the application. The application for payment and all required supporting documentation shall be submitted using the Fund's prescribed forms and electronic payment system. The Contractor shall include with such applications reports detailing actual payments to minority and women-owned businesses who participate on Fund projects. Failure of the Contractor to submit applications for progress payments, or lack of complete and accurate supporting data, shall be sufficient reason for withholding payment until such omissions or errors are rectified. Unless otherwise directed, such applications, signed and certified as correct by the Contractor, shall be delivered by the Contractor to the

Consultant once each month showing the total value of work completed and in place on the last day of the payment period covered by the application.

Section 4.12 Progress Payments for Materials Delivered to Site

(1) Progress payments made in accordance with Section 4.10 shall include a payment for materials and equipment to be furnished and installed under the Contract, after such materials and equipment have been delivered and accepted at the site of the work.

(2) Materials and equipment for which such progress payment has been made shall not be removed from the site, shall be stored until incorporated into the work in a location approved by the Consultant and shall be adequately protected from fire, theft and vandalism, the effects of the elements and any other damage whatsoever, and shall at all times be available for inspection by the Consultant and the Fund.

Section 4.13 Transfer of Title to Materials Delivered to Site

Title to all supplies and materials to be furnished or provided by the Contractor to the Fund pursuant to the provisions of the Contract Documents shall immediately vest in and become the sole property of the Fund upon delivery of such supplies and materials to the site. Notwithstanding such transfer of title, the Contractor shall have the full continuing responsibility to install such materials and supplies, protect them, maintain them in proper condition and forthwith repair, replace and make good any damage thereto without cost to the Fund until such time as the work covered by the Contract is fully accepted by the Fund. Such transfer of title shall in no way affect any of the Contractor's obligations under the Contract. In the event that, after title has passed to the Fund, any of such supplies and materials are rejected as being defective or otherwise unsatisfactory, title to all such supplies and materials shall be deemed to have been transferred back to the Contractor.

Section 4.14 Progress Payments for Materials Stored Off Site

(1) Progress payments made in accordance with Section 4.10 shall include a payment for materials and equipment which are in short and/or critical supply or have been specially fabricated for the Project. Materials and equipment, for which a progress payment is made pursuant to the preceding sentence, shall be stored by the Contractor, after fabrication, until

such time as their delivery to the site is required, at a facility and location approved by the Consultant; shall be adequately protected from fire, theft and vandalism, the effects of the elements and any other damage whatsoever; and shall at all times be available for inspection by the Consultant and the Fund. No progress payment shall, however, be made for said materials and equipment until:

a. The Contractor furnishes to the Fund a bill of sale listing quantity and costs of said materials and equipment f.o.b. point of origin;

b. The Consultant shall have inspected said materials and equipment and recommended payment therefor; and

c. The Contractor furnishes to the Fund a builder's risk insurance policy, with the broad form extended coverage endorsement, for said materials and equipment, in an amount equal to 100 percent of the value thereof, which policy shall be maintained, at the sole cost and expense of the Contractor, until said materials and equipment have been incorporated into the Project. The said insurance policy shall contain a provision that the loss, if any, is to be made adjustable with and payable to the Fund as trustee for the insured, i.e., the Fund and the Contractor, and a provision that it shall not be changed or cancelled and that it will be automatically renewed upon expiration and continued in force unless the Fund is given thirty (30) days written notice to the contrary.

d. The Contractor shall develop and provide a preventive maintenance log for stored equipment when determined appropriate by the Consultant. The Contractor shall provide timely notification and opportunity for the Consultant and the Fund to view the Contractor’s preventative maintenance efforts.

(2) Materials and equipment for which a progress payment has been made by the Fund pursuant to this Section shall be, become and remain the sole property of the Fund; provided, however, that the Contractor shall have the full continuing responsibility to install such materials and equipment, to deliver it to the site, to protect it, to maintain it in proper condition and to forthwith repair, replace and make good any damage thereto without cost and/or additional time to the Fund until such time as the work covered by the Contract is fully accepted by the Fund. Such transfer of title shall in no way affect any of the Contractor's obligations under the Contract.

Section 4.15 Withholding of Progress Payments

Notwithstanding anything contained in the Contract to the contrary, the Fund may withhold payment of all or any part of a progress, final or guarantee payment, in such an amount as it may deem proper to enforce the provisions of the Contract and to satisfy the claims of third parties, when:

a. The Fund shall learn of any claim, of whatsoever nature or kind, against the Fund or the Contractor, which in any way arises or is alleged to arise out of or as a result of or in connection with the performance by the Contractor of the work covered by the Contract or out of or in connection with the Contractor's operations or performance at or in the vicinity of the construction site, that, in the opinion of the Fund, may not be adequately covered by insurance.

   If an action on such claim is timely commenced and the liability of the Fund and/or the Contractor shall have been established therein by a final judgment of a court of competent jurisdiction, or if such claim shall have been admitted by the Contractor to be valid, the Fund shall pay such judgment or admitted claim out of the monies retained by it under the provisions of the Contract and return the balance, if any, without interest, to the Contractor.

   The Fund may withhold from the Contractor any payments retained by it until such time as all such claims are either satisfied or barred by law from being presented. At such time the Fund, upon written demand by the Contractor, shall return to the Contractor the amount so withheld, without interest.

b. The Contractor has not complied with any lawful or proper direction of the Consultant or the Fund or their representatives concerning the work covered by the Contract or the performance of the Contract or the production of records as required under the provisions of the Contract.

c. There exists any of the conditions, listed in Section 2.26, which would allow the Fund to declare the Contractor in default of the whole or any part of the work.

d. The Contractor is a foreign contractor and has not furnished satisfactory proof that all taxes due by such Contractor under the provisions of the Tax Law have been paid. The Certificate of the New

York State Tax Commission to the effect that all such taxes have been paid shall be conclusive proof of the payment of such taxes. The term "foreign contractor" as used herein means, in the case of an individual, a person who is not a resident of the State of New York; in the case of a partnership, one having one or more partners not a resident of the State; and in the case of a corporation, one not organized under the laws of the State of New York.

e. The Contractor, upon request of the Fund at any time after the initial progress payment by the Fund to the Contractor, fails to furnish the Fund with such documentary evidence that the Fund may deem necessary to prove to it that material and labor paid for by the Fund under previous applications for payment submitted have been paid for by the Contractor and that there are no outstanding claims or liens in connection therewith or fails to satisfy the Fund that the Contractor, with good cause, has sufficiently provided for the payment and/or satisfaction of claims for said material and labor.

Section 4.16 Lien Law

The attention of the Contractor is specifically called to the provisions of the Lien Law of the State of New York, wherein funds received by a Contractor for a public improvement are declared to constitute trust funds in the hands of such Contractor to be applied first to the payment of certain claims.

Section 4.17 Substitution of Securities for Retainage

Any time after 50 percent of all the work has been completed, the Fund, if the progress and performance of the work is satisfactory to it, on request of the Contractor, will allow the Contractor to withdraw up to 50 percent of the aforesaid amount retained by the Fund by depositing with the Comptroller of the State of New York government securities, of the type and kind specified in Section 139 of the State Finance Law, having a market value not exceeding par, at the time of deposit, equal to the amount so withdrawn. The Comptroller of the State of New York shall, from time to time, collect all interest or income on the obligations so deposited, and shall pay the same, when and as collected, to the Contractor. If the deposit be in the form of coupon bonds, the coupons as they respectively become due shall be delivered to the Contractor; provided, however, that the Contractor shall not be entitled to interest or coupons or income on any of the deposited securities, the proceeds of

which have or will be used or applied by the Fund. In the event that the Contractor does not, in accordance with the terms and provisions of the Contract, comply with and fulfill all of its obligations and responsibilities thereunder, the Comptroller of the State of New York shall have the right to sell, assign, transfer or otherwise dispose of the aforesaid securities and the Fund shall have the right to use and apply all or any part of the monies obtained by the Comptroller of the State of New York from such a sale, assignment, transfer or disposition or from the collection of interest or income from said securities to the performance and fulfillment of said obligations and responsibilities. Notwithstanding the foregoing, when the Fund makes a payment under Section 4.10 (3) of the Agreement, it will return to the Contractor, as part of such payment, its substituted securities, and thereafter all retention of the Fund shall be in funds and not in substituted securities.

Section 4.18 Final Payment

Upon acceptance of all the work, except for the Contractor's guarantee obligations under Section 2.25 of the agreement and the Contractor's guarantee obligations under any provision of the Specifications, the Contractor shall prepare and submit to the Fund and the Consultant, for their approval, a final application for payment, which the Fund, within thirty
(30) days after its approval of same, shall pay. Such application and payment shall be in an amount equal to 100 percent of the Contract consideration excluding the Contractor's guarantee obligations, less:

a. All previous payments by the Fund to the Contractor;

b. All deductions authorized to be made by the Fund under the Contract; and

c. An amount necessary, in the Fund's judgment, to satisfy any claims, liens or judgments against the Contractor which have not been suitably discharged.

d. The Contractor shall not be entitled to any interest on the monies retained by the Fund pursuant to Subdivision c of Section 4.18 of the Agreement.

Section 4.19 Acceptance of Final Payment

(1) The acceptance by the Contractor, or by any one claiming by or through it, of the final payment shall, except with respect to the amount retained by the Fund pursuant to the provisions of subdivisions b and c of Section 4.18 of the Agreement, constitute and

operate as a release to the Fund from any and all claims of any liability for anything theretofore done or furnished for or relating to or arising out of the work covered by the Contract and for any prior act, neglect or default on the part of the Fund or any of its trustees, officers, agents or employees in connection therewith.

(2) Should the Contractor refuse to accept the final payment as tendered by the Fund or should the Contractor refuse to execute the final application for payment without protest and without reserving any rights or claims against the Fund, it shall constitute a waiver of any right to interest on the amount of the payment so tendered and/or on the amount set forth in said final application for payment.

Section 4.20 Guarantee Payment

(1) Subject to the provisions of the second paragraph of this Section, at the expiration of one (1) year after the Fund has accepted all the work covered by the Contract, the Contractor shall prepare and submit to the Fund and the Consultant, for their approval, a guarantee application for payment, which the Fund, within thirty (30) days after its approval of same, shall pay. Such application and payment shall be in an amount equal to the monies retained by the Fund for the Contractor's guarantee obligations under the Agreement, less any monies deducted by the Fund under this Section. The Contractor shall not be entitled to any interest on the monies retained by the Fund pursuant to subdivision c of Section 4.18 of the Agreement.

(2) In the event the Contractor does not, in accordance with the terms and provisions of the Contract, complete all corrective work or comply with and fulfill its contractual obligations, the Fund may use and apply all or any part of the monies retained by it to have such work or obligations performed or fulfilled by a person, firm or corporation other than the Contractor. The obligations of the Contractor, under the terms and provisions of the Contract, shall not, however, be limited to the monies retained by the Fund pursuant to the provisions of the Contract.

(3) No payments may be made under this agreement for work completed more than 365 days after the completion date unless the date/duration listed on page A-1, is extended in writing by the Fund.

Section 4.21 Acceptance of Guarantee Payment

The acceptance by the Contractor or by anyone claiming by or through it, of the guarantee payment shall constitute and operate as a release to the Fund

from any and all claims in connection with monies retained by the Fund. Should the Contractor refuse to accept the guarantee payment as tendered by the Fund or should the Contractor refuse to execute the guarantee application for payment without protest and without reserving any rights or claims against the Fund, it shall constitute a waiver of any right to interest on the amount of the payment so tendered and/or on the amount set forth in said guarantee application for payment.

Section 4.22 Contractor Limited to Money Damages

Inasmuch as the Contractor can be compensated adequately by money damages for any breach of the Contract which may be committed by the Fund, the Contractor agrees that no default, act or omission of the Fund shall constitute a material breach of the Contract entitling it to cancel or rescind the same or to suspend or abandon performance thereof; and it hereby waives any and all rights and remedies to which it might otherwise be or become entitled to because of any wrongful act or omission of the Fund or its representatives, saving only its right to money damages.

Section 4.23 No Estoppel or Waiver

(1) The Fund shall not be precluded or estopped by any inspection, acceptance, application for payment or payment, final or otherwise, issued or made under the Contract or otherwise issued or made by it, the Consultant, or any trustee, officer, agent or employee of the Fund, from showing at any time the true amount and character of the work performed, or from showing that any such inspection, acceptance, application for payment or payment is incorrect or was improperly issued or made; and the Fund shall not be precluded or estopped, notwithstanding any such inspection, acceptance, application for payment or payment, from recovering from the Contractor any damages which it may sustain by reason of any failure on its part to comply strictly with the Contract and any monies which may be paid to it or for its account in excess of those to which it is lawfully entitled.

(2) Neither the acceptance of all or any part of the work covered by the Contract; nor any payment therefor; nor any order or application for payment issued under the Contract or otherwise issued by the Fund, the Consultant, or any trustee, officer, agent or employee of the Fund; nor any permission or direction to continue with the performance of the Contract before or after its specified completion date; nor any performance by the Fund of any of the Contractor's

duties or obligations; nor any aid lent to the Contractor by the Fund in its performance of such duties or obligations; nor any delay or omission by the Fund to exercise any right or remedy accruing to it under the terms of the Contract or existing at law or in equity or by statute or otherwise; nor any other thing done or omitted to be done by the Fund, its trustees, officers, agents or employees; shall be deemed to be a release to the Contractor or its sureties from any obligations, liabilities or undertakings in connection with the Contract or the Performance Bond or a waiver of any provision of the Contract or of any rights or remedies to which the Fund may be entitled because of any breach thereof, excepting only a written instrument expressly providing for such release or waiver. No cancellation, rescission or annulment hereof, in whole or as to any part of the Contract, because of any breach hereof, shall be deemed a waiver of any money damages to which the Fund may be entitled because of such breach. No waiver by the Fund of any breach of the Contract shall be deemed to be a waiver of any other or any subsequent breach.

Section 4.24 Limitation of Actions

(1) No action or proceeding shall be maintained by the Contractor, or anyone claiming under or through the Contractor, against the Fund, or its trustees, officers, agents or employees, upon any claim arising out of or based upon the Contract or any breach thereof or by reason of any act or omission or requirement of the Fund, or its trustees, officers, agents or employees, unless:

a. Such action or proceeding is instituted in the Supreme Court of the State of New York in and for the County of Albany;

b. The Contractor or the person claiming under or through it shall have strictly complied with all requirements relating to the giving of notices and information with respect to such claims and shall have provided the Fund with both electronic and hard copy versions of any claims, including all required information and electronic and hard copy versions of all contractually required notices that the Contractor provided to the Fund and the Consultant throughout the duration of the Contract ;

c. Such action or proceeding by the Contractor shall be commenced within eighteen months after the date of substantial completion set by the Fund or its Consultant and issued in writing to the Contractor. Any action or proceeding not

commenced within this time frame shall be dismissed with prejudice;

d. If the Contract is terminated or the Contractor declared in default by the Fund, such action is commenced within six (6) months after the date of such termination or declaration of default by the Fund; and

e. All claims and disputes which are subject to or related to this Contract and the Project shall be subject to non-binding mediation, at the sole option and discretion of the Fund. Should the Fund at its sole option and in the exercise of its sole discretion elect to mediate under this clause, then a letter from the Fund indicating the completion of such mediation shall be a condition precedent to any litigation by Contractor against the Fund or the State of New York. In the absence of the Fund exercising its right to proceed to mediation, the condition precedent to any litigation against the Fund of the State of New York, shall be a letter citing that the Fund declines its rights under this clause. The costs of any mediation shall be paid equally by the parties to the mediation.

(2) Notwithstanding anything in the laws of the State of New York to the contrary, the Contractor, or anyone claiming under or through the Contractor, shall not be entitled to any additional time to begin anew any other action if an action commenced within the times herein specified is dismissed or discontinued for any reason whatsoever.

Section 4.25 Electronic Payments

The Contractor shall provide complete and accurate payment applications in order to receive payment. Payment applications submitted must contain all information and supporting documentation required by the Fund. Payment for applications submitted by the Contractor shall only be rendered electronically unless payment by paper check is expressly authorized by the Fund's General Manager, in the General Manager's sole discretion, due to extenuating circumstances. Such electronic payment shall be made in accordance with ordinary State procedures and practices. The Contractor shall comply with the State Comptroller's procedures to authorize electronic payments. Authorization forms are available at the Office of the State Comptroller's website at www.osc.state.ny.us/epay/index.htm; by email at epunit@osc.state.ny.us; or by telephone at 518-474-4032. The Contractor acknowledges that it will not receive payment on any invoices submitted under this Contract if it does not comply with the State

Comptroller's electronic payment procedures, except where the Fund's General Manager has expressly authorized payment by paper check as set forth above.

Article V
Protection of Rights and Property

Section 5.01 Accidents and Accident Prevention

The Contractor shall at all times take reasonable precautions for the safety of persons engaged in the performance of the work. The Contractor shall comply fully with all applicable provisions of the laws of the State of New York and OSHA and with all valid rules and regulations thereunder. The Contractor's attention is specifically called to the applicable rules and regulations, codes and bulletins of the New York State Department of Labor.

Section 5.02 Adjoining Property

The Contractor shall be required to protect all the adjoining property and to repair or replace any such properties damaged or destroyed by it, its employees or subcontractors through, by reason of or as a result of activities under, for or related to the Contract.

Section 5.03 Emergencies

(1) In case of an emergency which threatens loss or injury to persons or property, the Contractor will be allowed to act, without previous instructions from the Consultant or the Fund, in a diligent manner, to the extent required to avoid or limit such loss or injury, and it shall notify the Consultant and the Fund immediately thereafter of the action taken by it and of such emergency. Where the Contractor has not taken action but has notified the Consultant or the Fund of an emergency which threatens loss or injury to persons or property, it shall act in accordance with the instructions and/or authorization by the Consultant or the Fund.

(2) In the event that the Contractor performs extra work in accordance with the preceding paragraph, it will be compensated therefor in accordance with the provisions of Section 4.02.

Section 5.04 Fire Safety

(1) Contractor shall comply with the General Requirements, Section paragraph titled Temporary Fire Protection.

(2) Solid fuel salamanders and heaters shall not be used by the Contractor or any of its subcontractors. All other salamanders used by the Contractor or any of its subcontractors shall require constant attendance of competent persons on each floor where in use.

(3) All temporary fabric used by the Contractor or any of its subcontractors for curtains or awnings shall be either non-combustible or flame retarded so that it will not burn or propagate flame.

Section 5.05 Risks Assumed by Contractor

(1) To the fullest extent permitted by law, the Contractor solely assumes the following distinct several risks whether they arise from acts or omissions (whether negligent or not and whether supervisory or otherwise) of the Contractor, of the Fund, of third persons or from any other cause, including unforeseen obstacles and difficulties which may be encountered in the prosecution of the work covered by the Contract, whether such risks are within or beyond the control of the Contractor and whether such risks involve a legal duty, primary or otherwise, imposed upon the Fund, the Dormitory Authority of the State of New York, the State of New York or the State University of New York, excepting only risks which arise from defects in maps, plans, designs or Specifications prepared, acquired or used by the Consultant or the Fund, from the negligence of the Fund, its agents or employees or from affirmative acts of the Fund, the Dormitory Authority of the State of New York, the State of New York or the State University of New York or their trustees, officers, agents or employees committed with intent to cause the loss, damage and injuries herein below set forth:

a. The risk of loss or damage, direct or indirect, to the work covered by the Contract or to any plant, equipment, tools, materials or property furnished, used, installed or received by the Fund or by the Contractor or any subcontractor, material man or worker performing services or furnishing materials for the work covered hereunder. The Contractor shall bear such risk of loss or damage until the work covered by the Contract has been finally accepted by the Fund or until completion of removal of such plant, equipment, tools, materials or property from the construction site and the vicinity thereof, whichever event occurs last. In the event of such loss or damage, the Contractor shall forthwith repair, replace and/or make good any such loss or damage without cost to the Fund.

b. The risk of claims, just or unjust, by third persons against the Contractor, the Fund, the Dormitory

Authority of the State of New York, the State of New York, or the State University of New York on account of wrongful death, bodily injuries and property damage, direct or consequential, loss or damage of any kind whatsoever arising or alleged to arise out of or as a result of or in connection with the performance by the Contractor of the work covered by the Contract (whether actually caused by or resulting from the performance of the Contract) or out of or in connection with the Contractor's operations or presence at or in the vicinity of the construction site.

(2) To the fullest extent permitted by law, the Contractor shall indemnify and save harmless the Fund, the Dormitory Authority of the State of New York, the State of New York and the State University of New York, their trustees, officers, agents or employees against all claims described above and for all costs and expenses incurred by them in the defense, settlement or satisfaction thereof, including attorneys' fees and court costs. If so directed, the Contractor shall at its own expense defend against such claims, in which event it shall not, without obtaining express advance permission from Counsel of the Fund, raise any defense involving in any way jurisdiction of the tribunal over the Fund, governmental nature of the Fund or the provisions of any statutes respecting suits against the Fund.

(3) Neither the Fund's final acceptance of the work to be performed hereunder nor the making of any payment shall release the Contractor from its obligations under this Section. The enumeration elsewhere in the Contract of particular risks assumed by the Contractor or of particular claims for which it is responsible shall not be deemed to limit the effect of the provision of this Section or to imply that it assumes or is responsible for only risks or claims of the type enumerated.

Section 5.06 Insurance Requirements

(1) General Provisions

a. Prior to the execution of the Agreement, the Contractor shall at its sole cost and expense, procure and furnish to the Fund a Certificate of Insurance and required endorsements in a form satisfactory to the Fund demonstrating that the Contractor has complied with the specific provisions of this Article and the Agreement, The Contractor shall maintain in force and effect at all times during the Agreement from Notice to Proceed until Final Acceptance, or as may otherwise be required by this Article and the

Agreement, policies of insurance covering all operations under the Agreement whether performed by the Contractor or its subcontractors as herein set forth.

b. All insurance required by the Agreement shall be written by companies that have an A.M. Best Company rating of "A-," Class "VII" or better. In addition, companies writing insurance intended to comply with the requirements of the Agreement shall be licensed or authorized by the New York State Department of Financial Services to issue insurance in the State of New York or meet such other requirements as may be acceptable to the Fund in its sole and exclusive discretion. If during the duration of coverage on the Agreement, the carrier's A.M. Best rating falls below "A-," Class "VII," the insurance must be replaced, on or before the renewal date of the policy with insurance that meets the requirements set forth herein.

(2) Submission of Insurance

a. **Coverage Types**. The types of insurance coverage and policy limits required from the Contractor pursuant to the Agreement are specified in Paragraph (3) Specific Coverage below and limits outlined in Schedule A attached hereto ("Schedule A").

b. **Policy.** Except as may be otherwise specifically provided herein or agreed to in writing by the Fund, policies of insurance must be maintained on an occurrence basis at all times during the Agreement from Notice to Proceed until Final Acceptance, or as may be otherwise required by this Article and the Agreement, with limits not less than those set forth in Schedule A and as required by the terms of the Agreement, or as required by law, whichever is greater. If such insurance contains an aggregate limit, it shall apply separately on a per project basis.

c. **Certificates of Insurance.** The Contractor shall provide the Fund a Certificate or Certificates of Insurance, on the appropriate Certificate of Liability Insurance ACORD form, as well as the ACORD 855 NY form for liability insurance including required policy endorsements, in accordance with New York Insurance Law and submitted directly by the insurance broker or agent to the Fund, before commencing any work under the Agreement. The certificate C105.2 or the U26.3 (State Insurance Fund) are the only acceptable proof of coverage for Worker's Compensation. The DB120.1 is the only

acceptable proof of coverage for Disability Benefits. Certificates must reference the NAIC number of the issuing company, policy number, effective dates of coverage, policy limits consistent with Schedule A and the Agreement requirements, name the Additional Insureds, and shall name the Fund as the Certificate Holder.

d. **Primary Coverage.** The liability and protective policies of insurance shall provide primary and non-contributory coverage to the Additional Insureds required in Section 5.06(2)(h) below for any claim arising from the Contractor's work under the Agreement, or because of the Contractor's activities. Any other insurance maintained by the Fund or Additional Insureds shall be in excess of and shall not contribute to the Contractor's insurance or subcontractor's insurance, regardless of the "other insurance" clause contained in the Fund's or Additional Insured's policy of insurance, if any. A copy of the endorsement reflecting this requirement may be requested by the Fund.

e. **Policy Renewal/Expiration.** Unless otherwise agreed to in writing by the Fund, all insurance policies must have a policy period of at least one year. Not less than five (5) days prior to the expiration date or renewal date of the policy for insurance, the Contractor shall supply the Fund with updated replacement certificates of insurance and required endorsements. The Contractor shall give written notice to the Fund of any letter or notification that cancels, materially changes, or non- renews the policy and the Contractor shall require the insurance carrier(s) to copy the Fund on any letter or notification that cancels, materially changes, or non- renews the policy.

Unless otherwise agreed to in writing by the Fund, policies shall be written to include a provision that the policy will not be canceled, materially changed, or not renewed without at least thirty (30) days' prior, written notice except for non-payment, in which case notice shall be provided as required by law from the insurance carrier to the Fund. In addition, if required by the Fund, the Contractor shall deliver to the Fund within three (3) business days of such request a copy of any or all certificates of insurance and required endorsements not previously provided.

If, at any time during the Agreement, the Fund determines that the insurance as required is not in effect as per the terms of the Agreement, or proof thereof is not provided to the Fund, or the

Contractor has otherwise failed to strictly adhere to the provisions of this Article, the Fund may withhold further Agreement payments and shall have the option to (i) direct the Contractor to stop work with no additional cost or extension of time due on account thereof; or (ii) treat such failure as an event of default under Section 2.26 of the Agreement..

With exception of the A.M. Best rating requirements, if at any time the coverage provisions and limits of the policies of insurance required herein do not meet the provisions and limits set forth in Schedule A and the Agreement, the Contractor shall immediately cease work on the project site. Further, the Contractor will not be allowed access to the project site without providing proof of proper insurance. The Contractor shall not resume work on the project until permitted to do so by the Fund. Any delay or time lost as a result of the Contractor not having insurance or providing proof thereof as required by this Article and the Agreement shall not give rise to a delay claim or any other claim by the Contractor against the Fund. If required by the Fund, the Contractor shall deliver to the Fund within fifteen (15) business days of such request, full and complete copies of any or all policies of insurance and endorsements relating to the project that were not previously provided, certified by the insurance carrier as true and complete.

f. **Self-Insured Retention / Deductibles.** Certificates must disclose any Deductible, Self-Insured Retention, Aggregate Limit or any exclusion to the policy that materially changes the coverage required by the Agreement, and Deductibles or Self-Insured Retentions above $25,000 shall be subject to approval from the Fund. The Contractor shall be solely responsible for all claim expenses and loss payments within the Deductible or Self-Insured Retention.

g. **Subcontractors.** Should the Contractor engage subcontractors, the Contractor shall impose on those entities the general insurance requirements of this Article and the Agreement. Required insurance limits shall be determined commensurate with the work of the subcontractor. The Contractor shall maintain the subcontractor certificates of insurance and required endorsements on file which shall be delivered to the Fund within three (3) business days of such request. If required by the Fund, the Contractor shall deliver to the Fund within fifteen (15) business days of such request, full and complete

copies of any or all subcontractor policies of insurance and endorsements relating to the project that were not previously provided, certified by the insurance carrier as true and complete.

h. **Additional Insureds**. The Contractor shall cause to be included in each of the liability insurance policies coverage for on-going and completed operations naming as Additional Insureds, The People of the State of New York, the State University of New York, the Dormitory Authority of the State of New York, the Fund, other such entities as named in Schedule A, and their officers, agents, and employees ("Additional Insureds"). An Additional Insured Endorsement evidencing such coverage shall be provided to the Fund prior to the commencement of the Agreement. Additional Insured protection afforded must contemplate on-going and completed operations, and the additional insured protection for products/completed operations must remain in place for three years after Final Acceptance. For Contractors who have Self-Insured Retention, the Contractor shall be obligated to defend and indemnify the above-named Additional Insureds with respect to Commercial General Liability insurance and Business Automobile Liability insurance, in the same manner that the Contractor would have been required to pursuant to this Article had the Contractor obtained such insurance policies.

i. **Waiver of Subrogation.** Unless otherwise agreed to in writing by the Fund, with the exception of Disability policies, all policies of insurance must be endorsed to provide that there shall be no right of subrogation against the State of New York, the State University of New York, the Dormitory Authority of the State of New York, the Fund, the Additional Insureds, and their officers, agents and employees. To the extent that any of the policies of insurance prohibit such a waiver of subrogation, the Contractor shall secure the necessary permission to make this waiver.

(3) Specific Coverage

The Contractor shall obtain and maintain in full force and effect, the following insurance with limits not less than those described in Schedule A and as required by the terms of the Agreement, or as required by law, whichever is greater:

a. **Commercial General Liability Insurance.** A Commercial General Liability ("CGL") insurance policy with coverage that shall include, but not be

limited to, coverage for bodily injury, property damage, personal/advertising injury, premises liability, independent contractors/ subcontractors, blanket contractual liability including tort liability of another assumed in contract, liability arising from all work and operations under the Agreement, defense and indemnification obligations, including those assumed under the Agreement, cross liability coverage for Additional Insureds, products/completed operations for a term no less than three years commencing upon Final Acceptance, explosion, collapse, and underground hazards, contractor means and methods, and liability resulting from Section 240 or Section 241 of the NYS Labor Law. Such policy shall be written on ISO Occurrence form CG 00 01 or a substitute form that is acceptable to the Fund, providing equivalent coverage.

The General Aggregate limit included in the CGL insurance shall apply separately on a per project basis at the limits set forth herein in Schedule A.

Insurance policies that remove or restrict blanket contractual liability located in the “insured contract” definition (as stated in Section V, Number 9, Item f in the ISO CGL policy) so as to limit coverage against claims that arise out of the work under the Agreement, or that remove or modify the “insured contract” exception to the employers liability exclusion, or that do not cover the Additional Insureds for claims involving injury to employees of the Named Insured or subcontractors, are not acceptable.

In the event any work under the Agreement involves activity on or within 50 ft. of railroad property or a railroad right-of-way or requires entrance upon a railroad property or railroad right- of-way, or requires an assignment of a Railroad employee, any exclusion for such work must be deleted. In addition, the Contractor shall otherwise fully comply with Section 5.06 (3)h below. For purposes of this paragraph, a subway is also a railroad.

b. **Comprehensive Business Automobile Liability Insurance.** A Commercial Automobile Liability insurance policy at the limits set forth herein in Schedule A covering liability arising out of the use of any motor vehicle in connection with the Agreement, including owned, leased, hired, and non-owned vehicles bearing, or, under the circumstances under which they are being used, required by the Motor Vehicle Laws of the State of New York to bear license plates. If the Agreement

involves the removal of hazardous waste from the project site or otherwise transporting Hazardous Materials, pollution liability coverage for covered autos shall be provided.

c. **Workers' Compensation.** New York State Workers' Compensation (including occupational disease) and Employer's Liability insurance coverage during the life of the Agreement for the benefit of the Contractor's and its subcontractors' employees as are required to be covered by the New York State Workers' Compensation Law.

   In the event any of the work under the Agreement involves activity on or near a shoreline or on or near navigable waterways or when any part of the work under the Agreement is connected to water related activities, an endorsement to the Workers' Compensation policy or the Protection & Indemnity policy providing coverage for all of the Contractor's and its subcontractors' employees under the Jones Act and the US Longshore and Harbor Workers' Compensation Act will be required and shall be delivered to the Fund within three (3) business days of such request. A waiver of subrogation in favor of the Additional Insureds must be included on the policy. In addition, the Contractor shall otherwise fully comply with Section 5.06(3)g below.

   Evidence of Workers' Compensation and Employer's Liability coverage must be provided to the Fund on forms specified by the Chairman of the New York State Workers' Compensation Board.

d. **Disability Benefits.** Disability coverage during the life of the Agreement for the benefit of the Contractor's and its subcontractors' employees as are required to be covered by the New York State Disability Benefits Law.

   Evidence of New York State Disability Benefits coverage must be provided to the Fund on forms specified by the Chairman of the New York State Workers' Compensation Board.

e. **Umbrella and Excess Liability.** When the limits of the CGL, Auto, and/or Employers Liability policies procured are insufficient to meet the limits specified in Schedule A, the Contractor shall procure and maintain Commercial Umbrella and/or Excess Liability policies with limits in excess of the primary, provided, however, that the total amount of insurance coverage is at least equal to the requirements set forth above. Such

policies shall follow the same form as the primary. Any insurance maintained by the Fund or Additional Insureds shall be considered in excess of and shall not contribute with any other insurance procured or maintained by the Contractor including primary, umbrella and excess liability regardless of the "other insurance" clause contained in either party's policy.

f. **Contractor's Pollution Liability.** If the Agreement involves abatement, handling, removal, repair, replacement, enclosure, encapsulation and/or disposal of any pollutants, which includes but is not limited to, petroleum, petroleum products, Hazardous Materials or substances including asbestos, lead, mercury, PCBs, fungus and those as defined by applicable State and federal laws and regulations (collectively referred to as "Hazardous Activities"), the Contractor shall procure, or otherwise obtain through an approved subcontractor, and maintain in full force and effect throughout the term of the Agreement, from Notice to Proceed and for three years after Final Acceptance, Contractor's Pollution Liability with limits as set forth in Schedule A, providing coverage for bodily injury and property damage, including loss of use of damaged property or of property that has not been physically injured. Such policy shall provide coverage for actual, alleged or threatened emission, discharge, dispersal, seepage, release or escape of pollutants, including any loss, cost or expense incurred as a result of any cleanup of pollutants or in the investigation, settlement or defense of any claim, suit, or proceedings against the Fund or Additional Insureds arising from the Contractor's or its subcontractors' work under the Agreement.

In addition, in the event the Contractor or any subcontractor is engaged in Hazardous Activities related to the Agreement, the Contractor or subcontractor shall, to the fullest extent permitted by law, hold harmless and indemnify the Additional Insureds and their trustees, officers, agents or employees, for any claims or liabilities in connection with illness or sickness arising from work performed, not performed, or which should have been performed. The Contractor shall have said hold-harmless and indemnification conditions stipulated in all contracts with subcontractors.

g. **Marine General Liability, Protection & Indemnity, Hull & Machinery, Jones Act and United States Longshore and Harbor Workers' Act Coverage.** In the event any of the work under

the Agreement involves activity on or near a shoreline or on or near navigable waterways or when any part of the work under the Agreement is connected to water related activities (collectively referred to as "Marine Operations"), Marine General Liability, Protection & Indemnity and Hull and Machinery coverage is required. Hull and Machinery coverage shall be provided for the total value of the watercraft and equipment used. The Contractor shall obtain Marine General Liability and Protective and Indemnity Liability Insurance for all Marine Operations relating to the Agreement at the limits set forth herein in Schedule A. Any endorsements that eliminate or minimize coverage for claims related to the imposition of New York Labor Law are prohibited. Certificate of Liability Insurance must be provided that certifies the required coverage is in place and must be accompanied by an ACORD 855 form or its equivalent.

h. **Railroad Protective Liability**. In the event any work under the Agreement involves activity on or within 50 ft. of railroad property or a railroad right-of-way, or requires entrance upon a railroad property or railroad right-of-way, or requires an assignment of a Railroad employee, the Contractor shall provide and maintain a Railroad Protective Liability ("RPL") Insurance Policy in the amount required by the respective railroad as set forth herein in Schedule A. For purposes of this paragraph, a subway is also a railroad.

The RPL policy must name the Railroad as the Named Insured. No Additional Insureds may be listed on the RPL policy and the definition of "physical damage to property" must be amended to mean direct and accidental loss of or damage to "all property of any Named Insured and all property in any Named Insured's care, custody or control."

Evidence of RPL must be provided to the Fund on a Certificate of Insurance, and a detailed Binder pending issuance of the policy, or on an ISO-RIMA or equivalent form approved by the Railroad and meet any other requirements as specified by the Railroad and/or the Fund."

Section 5.07 Builder's Risk

(1) The Fund shall, except as otherwise specified in the Agreement, beginning with the Notice to Proceed and at all times during construction and until Substantial Completion, procure and maintain

Builder's Risk insurance (the "BRI") at the sole cost and expense of the Fund. The Contractor and subcontractors will be provided coverage under the BRI for the Contractor's work under the Agreement. The Fund shall, at the Fund's discretion, have the sole authority to adjust and to settle any loss or claim under the BRI. Reimbursement for loss, if any, shall be made payable to the Fund.

(2) BRI coverage shall also apply to materials and equipment stored offsite as defined under the terms of the Contract, the coverage shall include a broad form extended coverage endorsement in an amount equal to 100 percent of the value thereof, which coverage shall be maintained until said materials and equipment have been incorporated into the Project.

(3) The Contractor, at its sole cost and expense, shall be responsible to fully cooperate with the Fund and the BRI insurer by timely providing all necessary information and documentation to permit prompt reporting of any loss or claim to the BRI insurer and/or its representatives and by furnishing the Fund and/or the BRI insurer with all necessary details relating to any occurrence of loss and/or claim, the amount thereof, and by further participating in any investigation, proceedings, or otherwise, as may be reasonably requested in connection therewith. In the event the Contractor fails to fully and adequately take such action, the Contractor shall indemnify and save the Fund harmless from any and all costs, charges, expenses and liabilities incurred by the Fund as a result thereof.

The Fund, the Contractor and all subcontractors of the Contractor waive all rights, each against the others, for damages caused by fire or other perils covered by insurance provided under the terms of this Article, except such rights as they may have to the proceeds of insurance received; provided, however, this waiver shall not apply to any manufacturer, supplier or similar agent under any guarantee or warranty.

(4) The Contractor shall not violate or permit to be violated any condition of the BRI and shall at all times satisfy the fire safety requirements of the Fund and the insurance company issuing the same.

(5) The procurement and maintenance of the BRI shall in no way be construed or be deemed to relieve the Contractor from any of the obligations and risks imposed upon it by the Agreement or to be a limitation on the nature or extent of such obligations and risks nor limit Contractor's liability for damages and/or losses to the project."

Section 5.08 Effect of Procurement of Insurance

Neither the procurement nor the maintenance of such insurance shall in any way affect or limit the obligations, responsibilities or liabilities of the Contractor hereunder.

Section 5.09 No Third Party Rights

Nothing in this Section or in this Agreement shall create or give to third parties, except the Dormitory Authority of the State of New York, the State of New York and the State University of New York any claim or right of action against the Contractor, the Consultant, the Fund, the Dormitory Authority of the State of New York, the State of New York and the State University of New York beyond such as may legally exist irrespective of this Section or this Agreement.

Article VI
Minority and Women's Business Enterprises (MWBEs) / Equal Employment Opportunity (EEO) Provisions

Section 6.01 Definitions

The terms "Minority-owned business enterprise" ("MBE**"),** "Women-owned business enterprise" ("WBE") or "minority group member", and "Subcontract" shall have the same meaning as under Article 15-A of the New York State Executive Law, and 5 NYCRR Parts 140 – 145, as the same may be from time to time amended.

Section 6.02 MWBE/EEO Policy Statement

(1) The Fund recognizes the need to take affirmative action to promote the employment of minority group members and women and to ensure that Minority and Women Business Enterprises are given the opportunity to participate in the performance of its construction program. This opportunity for participation in our free enterprise system by socially and economically disadvantaged persons is essential to obtain social and economic equality and improve the functioning of the State economy. Accordingly, it is the policy of the Fund to provide for participation of minorities and women on the Project.

(2) The Contractor acknowledges its understanding of the policy herein stated and agrees to cooperate with the Fund in the implementation of this policy.

Section 6.03 Participation by Minority and Women's Business Enterprises (MWBEs)/ Equal Employment Opportunity (EEO)

(1) General Provisions

a. The Fund is required to implement the provisions of New York State Executive Law Article 15-A, 5 NYCRR Parts 140-145 of the New York Codes, Rules and Regulations ("NYCRR"), and Executive Order No. 162 dated January 9, 2017 ("E.O. 162") for all State contracts as defined therein, with a value (1) in excess of $25,000 for labor, services, equipment, materials, or any combination of the foregoing or (2) in excess of $100,000 for real property renovation and/or construction.

b. The Contractor agrees, in addition to any other nondiscrimination provision of the Contract and at no additional cost to the Fund, to fully comply and cooperate with the Fund in the implementation of New York State Executive Law Article 15-A, the regulations promulgated thereunder, and E.O. 162. These requirements include equal employment opportunities for minority group members and women ("EEO") and contracting opportunities for New York State certified minority and women-owned business enterprises ("MWBEs"). Contractor's demonstration of "good faith efforts" pursuant to 5 NYCRR §142.8 shall be a part of these requirements. These provisions shall be deemed supplementary to, and not in lieu of, the nondiscrimination provisions required by New York State Executive Law Article 15 (the "Human Rights Law") and other applicable federal, state or local laws.

c. Failure to comply with all of the requirements herein may result in a finding of non- responsiveness, non-responsibility and/or a breach of contract, leading to the assessment of liquidated damages pursuant to Section 7 of this Article, withholding of funds and such other remedies as may be available to the Fund pursuant to the Contract and applicable law, including but not limited to bid rejection or contract termination for cause.

d. Contractor will include the provisions of this Article in each and every agreement,

contract, and/or subcontract with each and every subcontractor and supplier in such a manner that the provisions of this Article will be binding upon each subcontractor and supplier as to work in connection with and related to this Agreement. All subcontractors and suppliers must be approved by the Fund and the MWBE Utilization plans are subject to approval by the Fund's Opportunities Program.

(2) Contract Goals

a. For purposes of this Contract, the Fund hereby establishes goals of for New York State-certified Minority-Owned Business Enterprises ("MBE") participation and for New York State-certified Women-Owned Business Enterprises ("WBE") participation (collectively "MWBE Contract Goals") based on the current availability of MBEs and WBEs.

i. The goal for Minority-Owned Business Enterprise participation shall be applied as follows: a maximum of one third (1/3) of the goal may be applied to purchases of materials, supplies, and equipment from MBEs.

ii. The goal for Women-Owned Business Enterprise participation shall be applied as follows: a maximum of one third (1/3) of the goal may be applied to purchases of materials, supplies, and equipment from WBEs.

b. For purposes of providing meaningful participation by MWBEs on the Contract and achieving the MWBE Contract Goals established in Section 2a hereof, Contractor should reference the Directory of New York State Certified MWBEs found at the following internet address: https://www.ny.newnycontracts.com.

Additionally, the Contractor is encouraged to contact the Fund's Opportunities Program Office. The Contractor can also reach out to the Division of Minority and Women's Business Development at (212) 803-2414 to discuss additional methods of maximizing participation by MWBEs on the Contract.

c. The Contractor understands that only sums paid to MWBEs for the performance of a

commercially useful function, as that term is defined in 5 NYCRR §140.1, may be applied towards the achievement of the applicable MWBE participation goal. The portion of a contract with an MWBE serving as a supplier, that shall be deemed to represent the commercially useful function performed by the MWBE, shall be 60 percent of the total value of the contract. The portion of a contract with an MWBE serving as a broker, that shall be deemed to represent the commercially useful function performed by the MWBE, shall be the monetary value for fees, or the markup percentage, charged by the MWBE.

d. Where MWBE Contract Goals have been established herein, the Contractor must document "good faith efforts" pursuant to pursuant to 5 NYCRR §142.8, to provide meaningful participation by MWBE's as subcontractors and suppliers, in the performance of the Contract. Such documentation shall include, but not necessarily be limited to:

i. Evidence of outreach to MWBEs,

ii. Any responses from MWBE's to the Contractor's outreach;

iii. Copies of advertisements for participation by MWBEs in appropriate general circulation, trade and minority or women- owned publications;

iv. The dates of attendance at any pre-bid, pre-award or other meetings, if any, scheduled by the Fund with MWBE's; and,

v. Information describing specific steps undertaken by the Contractor to reasonably structure the Contract Scope of work to maximize opportunities for MWBE participation.

(3) Equal Employment Opportunity (EEO)

a. The provisions of Article 15-A of the Executive Law, the rules and regulations promulgated thereunder, and E.O. 162 pertaining to equal employment opportunities for minority group members and women, shall apply to the Contract. Contractor agrees to be bound by them. In the event of any conflict, the provisions of the statute, regulations and

Executive Order shall govern over any contrary provisions of this Agreement.

b. In performing the Contract, the Contractor shall:

i. Ensure that the Contractor and each contractor and subcontractor performing work on the Contract shall undertake or continue existing EEO programs to ensure that minority group members and women are afforded equal employment opportunities without discrimination because of race, creed, color, national origin, sex, age, disability or marital status. For these purposes, EEO shall apply in the areas of recruitment, employment, job assignment, promotion, upgrading, demotion, transfer, layoff, or termination and rates of pay or other forms of compensation.

ii. Within seven (7) calendar days after the opening of bids or upon receipt of a request by the Fund, the Contractor shall have submitted an EEO policy statement to the Fund.

iii. If the Contractor or any of its sub-contractors do not have an existing EEO policy statement, the Fund may require the Contractor or subcontractor to adopt a model statement.

iv. The Contractor's EEO policy statement shall include the following language:

(a) The Contractor will not discriminate against any employee or applicant for employment because of race, creed, color, national origin, sex, age, disability or marital status, will undertake or continue existing EEO programs to ensure that minority group members and women are afforded equal employment opportunities without discrimination, and shall make and document its conscientious and active efforts to employ and utilize minority group members and women in its work force.

(b) The Contractor shall state in all solicitations or advertisements for employees that, in the performance of the Contract, all qualified applicants will be afforded equal employment opportunities without discrimination because of race, creed, color,

national origin, sex, age, disability or marital status.

(c) At the request of the Fund, the Contractor shall request each employment agency, labor union, or authorized representative of workers with which it has a collective bargaining or other agreement or understanding, to furnish a written statement that such employment agency, labor union, or representative will not discriminate on the basis of race, creed, color, national origin, sex age, disability or marital status and that such union or representative will affirmatively cooperate in the implementation of the Contractor 's obligations herein.

(d) The Contractor will include the provisions of paragraphs a through c of this subdivision (iv) and paragraph e of this subsection 3 which provides for relevant provisions of the Human Rights Law, in every subcontract in such a manner that the requirements of the subdivision will be binding upon each subcontractor as to work in connection with the Contract.

c. Staffing Plan

To ensure compliance with E.O.162, in connection with all low bids in excess of $250,000, the Contractor shall, as a required condition of contract award, prepare and submit a staffing plan, as part of the Contractor's bid or proposal, or within a reasonable time after the bid opening or proposal submission and prior to final contract award, as directed by the Fund. The Contractor shall do so using the staffing plan form provided by the Fund, to document the composition of the proposed workforce to be utilized in the performance of the Contract by the specified categories listed, including ethnic background, gender, and Federal occupational categories.

d. Monthly Workforce Utilization/Gross Wages Report

i. For each and every real property renovation and/or construction contract in excess of $100,000, the Contractor shall, during the term of the Contract and as part of the normal course of performing the work of the Contract, submit a monthly Workforce Utilization/Gross Wages Report, and shall

require each of its subcontractors to submit a Workforce Utilization/Gross Wages Report in the electronic form prescribed by the Fund on a monthly basis.

ii. Separate forms shall be completed by the Contractor and any subcontractors.

iii. Pursuant to E.O.162, in addition to required Equal Employment Opportunity (EEO) information, the Contractor and its subcontractors are also required to include in such monthly reports the job titles and gross wages paid to each of their employees for the work performed by such employees on the Contract; or for each and every member of their entire workforce, if they are unable to determine which employees are working directly on the contract for which the report is submitted.

e. Contractor shall comply with the provisions of the Human Rights Law, all other State and Federal statutory and constitutional non-discrimination provisions. Contractor and sub-contractors shall not discriminate against any employee or applicant for employment because of race, creed (religion), color, sex, national origin, sexual orientation, military status, age, disability, predisposing genetic characteristic, marital status or domestic violence victim status, and shall also follow the requirements of the Human Rights Law with regard to non-discrimination on the basis of prior criminal conviction and prior arrest.

(4) MWBE Utilization Plan

a. The Contractor represents and warrants that Contractor has submitted an MWBE Utilization Plan for the Fund's approval prior to the execution of the Contract and within seven (7) calendar days after receipt of a request thereof.

b. Contractor agrees to adhere to such MWBE Utilization Plan in the performance of the Contract.

c. Contractor further agrees that a failure to submit and/or adhere to such MWBE Utilization Plan may constitute a material breach of the terms of the Contract. Upon the occurrence of such a material breach, the Fund shall be entitled to any remedy provided herein, including but not limited to, a finding that the Contractor is non-responsive

(5) Waivers

If the Contractor, after making good faith efforts, is unable to achieve the MWBE Contract Goals stated herein, the Contractor may submit a request for a waiver through a method provided by the Fund. Such waiver request must be supported by evidence of the Contractor's good faith efforts to achieve the maximum feasible MWBE participation towards the applicable MWBE Contract Goals. If documentation included with the waiver request is completed, the Fund shall evaluate the request and issue a written notice of approval or denial within twenty (20) business days of receipt.

If the Fund, upon review of the MWBE Utilization Plan, the reports described in Section 6.04, or any other relevant information, determines that the Contractor is failing or refusing to comply with the MWBE Contract Goals, and no waiver has been issued in regards to such non-compliance, the Fund may issue a notice of deficiency to the Contractor. The Contractor must respond to the notice of deficiency within seven (7) business days of receipt. Such response may include a request for partial or total waiver of MWBE Contract Goals.

(6) Liquidated Damages

a. Where the Fund determines that Contractor is not in compliance with the provisions of this Article and the Contractor refuses to comply with such requirements, or if the Contractor is found to have willfully and intentionally failed to comply with the MWBE Contract Goals, Contractor shall be obligated to pay liquidated damages to the Fund.

b. Such liquidated damages shall be calculated as an amount equaling the difference between:

   i. All sums identified for payment to MWBEs had the Contractor achieved the contractual MWBE goals; and

   ii. All sums actually paid to MWBEs for work performed or materials supplied under the Contract.

c. In the event a determination has been made which requires the payment of liquidated damages and such identified sums have not been withheld by the Fund, Contractor shall pay such liquidated damages to the Fund

within sixty (60) days after they are assessed. Provided, however, that if the Contractor has filed a complaint with the Director of the Division of Minority and Woman Business Development pursuant to 5 NYCRR § 142.12, liquidated damages shall be payable only in the event of a determination adverse to the Contractor following the complaint process.

Section 6.04 Reports, Records and Documentation

a. The Contractor shall, for each and every real property renovation and/or construction contract in excess of $100,000, file with the Fund monthly reports in the electronic form prescribed by the Fund, regarding actions taken pursuant to this Article, as well as a list of and value of subcontracts and supply contracts.

b. The Contractor shall permit access to its books, records and accounts by the Fund for purposes of investigation to ascertain compliance with the provisions of this Article. The Contractor shall include this provision in every subcontract so that such provision will be binding upon each subcontractor.

c. Failure to comply with the foregoing requirements entitles the Fund to take such action as the withholding of funds, suspension or termination of the Contract or such other actions or enforcement proceedings as allowed by the Contract. Such failure may also result in a finding of non-responsiveness, non-responsibility and/or a breach of the Contract.

Article VII
Provisions Required by Law

Section 7.01 Provisions Deemed Inserted

Each and every provision required by law to be inserted in the Contract, including, but not limited to, the applicable provisions set forth in Schedule "A" which is attached hereto and made a part hereof, shall be deemed to be inserted herein and the Contract shall be read and enforced as though it were included herein and, in the event any such provision is not inserted or is not correctly inserted, then, upon the application of either party, this Contract shall forthwith be physically amended to make such insertion or correction.

Section 7.02 Wage Rates

The Contractor shall post the appropriate prevailing wage schedules in a conspicuous place at the construction site. The Department of Labor shall provide the Contractor with posters relating to prevailing wage rates and same shall be displayed by the Contractor in a conspicuous place at the construction site. The Contractor shall also distribute wallet cards, to be provided by the Department of Labor, to all workers engaged at the construction site containing information relating to wage rates and telephone numbers to call if a worker believes his or her rights are being violated. The Contractor shall provide each worker with a written notice, informing them of the applicable prevailing wage requirements, and the Contractor must obtain a signed statement or declaration from such worker attesting to the fact that he or she has been given this information. Further, the Contractor is required to keep certified copies of its payrolls at the construction site.

Section 7.03 Iran Energy Sector Divestment

Pursuant to New York State Finance Law §165-a, Iran Divestment Act of 2012 (Act), the Office of General Services is required to post on its website a list of persons who have been determined to engage in investment activities in Iran ("prohibited entities list"), as defined by the Act. New York State Public Authorities Law § 2879-c, with certain exceptions, prohibits the Fund from entering into or awarding a Contract with persons identified on the prohibited entities list and requires that the person (as defined in paragraph (e) of subdivision one of Section 165-a of the State finance law) entering into the contract with the Fund certify, under penalty of perjury, that it is not on the prohibited entities list. By signing this Agreement with the Fund, each person (as defined in paragraph (e) of subdivision one of Section 165-a of the State finance law) and each person signing on behalf of any other party certifies, and in the case of a joint bid or partnership each party thereto certifies as to its own organization, under penalty of perjury, that to the best of its knowledge and belief that each person is not on the prohibited entities list.

Article VIII
Vendor
Responsibility

(1) The Contractor shall at all times during the Agreement term remain responsible. The Contractor shall provide the Fund with written notice as required by this Article of any issues impacting its responsibility,

which shall minimally include updated responses to the its filed vendor responsibility questionnaire. The Contractor agrees, if requested by the Fund, to present evidence of its continuing legal authority to do business in New York State, integrity, experience, ability, prior performance and organizational and financial capacity.

(2) The Fund, at its sole discretion, reserves the right to suspend any or all activities under this Agreement, at any time, when the Fund discovers information that calls into question the responsibility of the Contractor. In the event of such suspension, the Contractor will be given written notice outlining the particulars of such suspension. Upon issuance of such notice, the Contractor must comply with the terms of the suspension order. Agreement activity may resume at such time as the Fund issues a written notice authorizing a resumption of performance under the Agreement.

(3) Upon written notice to the Contractor, and a reasonable opportunity to be heard with appropriate Fund officials or staff, the Contractor may be terminated by the Fund at the Contractor's expense where the Contractor is determined by the Fund to be non-responsible. In such event, the Fund may complete the contractual requirements in any manner that the Fund may deem advisable and pursue available legal or equitable remedies for breach.

(4) In addition to the notice requirements set forth in Section 1.12 of this Agreement, the Contractor shall provide the notice required by this section as follows:

The State University Construction Fund
Attention: Harry McLellan, General Counsel
The H. Carl McCall SUNY Building
353 Broadway, Albany, NY 12246
Telephone Number: (518) 320-1748
E-mail address: Harry.McLellan@suny.edu

In no case shall termination of the Contract by the Fund be deemed a breach by the Fund thereof, nor shall the Fund be liable for any damages or lost profits or otherwise, which may be sustained by Contractor as a result of such termination.

Article IX
Use of Service-Disabled Veteran-Owned Business Enterprises in Contract Performance

(1) Article 17-B of New York State Executive Law acknowledges that Service-Disabled Veteran-Owned Businesses (SDVOBs) strongly contribute to the economies of the State and the nation. As defenders

of our nation and in recognition of their economic activity in doing business in New York State, the Contractor for the Project and Work defined in this Agreement, agrees to, at no additional cost to the Fund, fully comply and cooperate with the Fund's implementation of New York State Executive Law Article 17-B and provide opportunities for SDVOBs in the fulfillment of the requirements of this Agreement. SDVOBs can be readily identified on the directory of certified businesses at:

https://ogs.ny.gov/Veterans/#1

(2) The Contractor is strongly encouraged to the maximum extent practical and consistent with legal requirements of the State Finance Law and the Executive Law to use responsible and responsive SDVOBs in purchasing and utilizing commodities, services and technology that are of equal quality and functionality to those that may be obtained from non- SDVOBs. Furthermore, Contractors are reminded that they must continue to utilize small, minority and women-owned businesses consistent with current State law

(3) Utilizing SDVOBs in State contracts will help create more private sector jobs, rebuild New York State's infrastructure, and maximize economic activity to the mutual benefit of the Contractor and its SDVOB partners. SDVOBs will promote the Contractor's optimal performance under the Agreement, thereby fully benefiting the public sector programs that are supported by associated public procurements.

(4) Public procurements can drive and improve the State's economic engine through promotion of the use of SDVOBs by the Contractor. The Fund, therefore, expects Contractors to provide maximum assistance to SDVOBs in the performance of services for this Agreement. The potential participation by all kinds of SDVOBs will deliver great value to the State and its taxpayers.

(5) For the purposes of this Agreement, the Fund hereby establishes the goal of participation for SDVOBs. For the purposes of providing meaningful participation by SDVOBs on the Agreement and achieving the Agreement Goal, the Contractor should reference the directory of New York State Certified SDVOBs at the following internet address:

https://ogs.ny.gov/Veterans/#1

(6) Damages – SDVOB Participation: Any Contractor who willfully and intentionally fails to comply with the SDVOB participation requirements of

the SDVOB regulations set forth in 9 NYCRR Section 252, and as set forth in this Agreement, shall be liable to the Fund for damages as otherwise specified in this agreement, and shall provide for other appropriate remedies on account of such breach. Damages shall be calculated based on the actual cost incurred by the Fund related to the Fund's expenses for personnel, supplies and overhead related to establishing, monitoring and reviewing certified SDVOB enterprise programmatic goals.

(7) The Contractor is required to submit a Compliance Report to the Fund in every application for payment or by request of the Fund and such report must document the progress made towards achievement of the SDVOB goal of the Agreement.

IN WITNESS WHEREOF, the parties hereto have executed this Agreement as of the day and year first above written.

STATE UNIVERSITY CONSTRUCTION FUND

By_____

Title_____

Name _____

«Company_Name»

By_____

Date: _____

If Corporation, affix Corporate Seal

SUCF Project No.

Contract No.

ACKNOWLEDGMENTS

(ACKNOWLEDGMENT BY INDIVIDUAL)

STATE OF)
COUNTY OF) SS:

On this_____day of_____, 20_____, before me personally came

_____, to me known and known to me to be the

person described in and who executed the foregoing instrument and he acknowledged to me that he executed the same.

_____
Notary Public

(ACKNOWLEDGMENT BY PARTNERSHIP)

STATE OF)
COUNTY OF) SS:

On this_____day of_____, 20_____, before me personally came

_____, to me known and known to me to be the

person who executed the above instrument, who, being duly sworn by me, did for h self depose and say that he is a

member of the firm of_____consisting of h self and
_____

that he executed the foregoing instrument in the firm name of _____

and that he had authority to sign same, and he did duly acknowledge to me that he executed the same as the act and deed

of said firm of_____,for the uses and purposes mentioned therein.

_____
Notary Public

(ACKNOWLEDGEMENT BY CORPORATION)

STATE OF)
COUNTY OF) SS:

On this_____day of_____, 20____, before me personally came

_____, to me known, who, being by me duly sworn, did depose

and say that he/she/they reside(s) in_____; that he/she/they is (are) the

_____ (president or other officer or director or attorney in fact duly appointed) of the

_____ (name of corporation), the corporation described in and which executed

the above instrument; and that he/she/they signed his/her/their name(s) thereto by authority of the board of directors of said

corporation.

_____
Notary Public

Appendix "A"
Standard Clauses For New York State Contracts

The parties to the attached contract, license, lease, amendment or other agreement of any kind (hereinafter, "the contract" or "this contract") agree to be bound by the following clauses which are hereby made a part of the contract (the word "Contractor" herein refers to any party other than the State or the State University Construction Fund, whether a contractor, licensor, licensee, lessor, lessee or any other party; the State University Construction Fund shall hereinafter be referred to as the "Fund"):

1. EXECUTORY CLAUSE. In accordance with Section 41 of the State Finance Law, the State and the Fund shall have no liability under this contract to the Contractor or to anyone else beyond funds appropriated and available for this contract.

2. NON-ASSIGNMENT CLAUSE. In accordance with Section 138 of the State Finance Law, this contract may not be assigned by the Contractor or its right, title or interest therein assigned, transferred, conveyed, sublet or otherwise disposed of without the State's or the Fund's previous written consent, and attempts to do so are null and void. Notwithstanding the foregoing, such prior written consent of an assignment of a contract let pursuant to Article XI of the State Finance Law may be waived at the discretion of the Fund and with the concurrence of the State Comptroller where the original contract was subject to the State Comptroller's approval, where the assignment is due to a reorganization, merger or consolidation of the Contractor's business entity or enterprise. The Fund retains its right to approve an assignment and to require that any Contractor demonstrate its responsibility to do business with the Fund. The Contractor may, however, assign its right to receive payments without the Fund's prior written consent unless this contract concerns Certificates of Participation pursuant to Article 5-A of the State Finance Law.

3. COMPTROLLER'S APPROVAL. (a) In accordance with Section 112 of the State Finance Law and Section 373 of the Education Law, the State Comptroller's approval is required for the following contracts: (i) goods, services, construction and construction-related services which exceed $75,000 and (ii) purchases utilizing an Office of General Services centralized contract which exceed $200,000;

(b) If this contract exceeds the threshold amounts listed above in Paragraph 3(a), or, if this is an

amendment for any amount to a contract which, as so amended, exceeds said threshold amounts, or if, by this contract, the State or the Fund agrees to give something other than money when the value or reasonably estimated value of such consideration exceeds $25,000, it shall not be valid, effective or binding upon the the Fund or the State and the Fund and the State shall bear no liability, until it has been approved by the State Comptroller or the pertinent pre-audit reviw period has elapsed without State Comptroller approval or rejection and such contracts are filed in his or her office.

4. WORKERS' COMPENSATION BENEFITS. In accordance with Section 142 of the State Finance Law, this contract shall be void and of no force and effect unless the Contractor shall provide and maintain coverage during the life of this contract for the benefit of such employees as are required to be covered by the provisions of the Workers' Compensation Law.

5. NON-DISCRIMINATION REQUIREMENTS. To the extent required by Article 15 of the Executive Law (also known as the Human Rights Law) and all other State and Federal statutory and constitutional non- discrimination provisions, the Contractor will not discriminate against any employee or applicant for employment, nor subject any individual to harassment, because of age, race, creed, color, national origin, citizenship or immigration status, sexual orientation, gender identity or expression, military status, sex, disability, predisposing genetic characteristics, familial status, marital status, or domestic violence victim status or because the individual has opposed any practices forbidden under the Human Rights Law or has filed a complaint, testified, or assisted in any proceeding under the Human Rights Law. Furthermore, in accordance with Section 220-e of the Labor Law, if this is a contract for the construction, alteration or repair of any public building or public work or for the manufacture, sale or distribution of materials, equipment or supplies, and to the extent that this contract shall be performed within the State of New York, Contractor agrees that neither it nor its subcontractors shall, by reason of race, creed, color, disability, sex, or national origin:
(a) discriminate in hiring against any New York State citizen who is qualified and available to perform the work; or (b) discriminate against or intimidate any employee hired for the performance of work under this contract. If this is a building service contract as defined in Section 230 of the Labor Law, then, in

accordance with Section 239 thereof, Contractor agrees that neither it nor its subcontractors shall by reason of race, creed, color, national origin, age, sex or disability: (a) discriminate in hiring against any New York State citizen who is qualified and available to perform the work; or (b) discriminate against or intimidate any employee hired for the performance of work under this contract. Contractor is subject to fines of $50.00 per person per day for any violation of Section 220-e or Section 239 as well as possible termination of this contract and forfeiture of all moneys due hereunder for a second or subsequent violation.

6. WAGE AND HOURS PROVISIONS. If this is a public work contract covered by Article 8 of the Labor Law or a building service contract covered by Article 9 thereof, neither Contractor's employees nor the employees of its subcontractors may be required or permitted to work more than the number of hours or days stated in said statutes, except as otherwise provided in the Labor Law and as set forth in prevailing wage and supplement schedules issued by the State Labor Department. Furthermore, Contractor and its subcontractors must pay at least the prevailing wage rate and pay or provide the prevailing supplements, including the premium rates for overtime pay, as determined by the State Labor Department in accordance with the Labor Law. Additionally, effective April 28, 2008, if this is a public work contract covered by Article 8 of the Labor Law, the Contractor understands and agrees that the filing of payrolls in a manner consistent with Subdivision 3-a of Section 220 of the Labor Law shall be a condition precedent to payment by the Fund of any Fund approved sums due and owing for work done upon the project.

7. NON-COLLUSIVE BIDDING CERTIFICATION. In accordance with Section 139-d of the State Finance Law, if this contract was awarded based upon the submission of bids, Contractor affirms, under penalty of perjury, that its bid was arrived at independently and without collusion aimed at restricting competition. Contractor further affirms that, at the time Contractor submitted its bid, an authorized and responsible person executed and delivered to the Fund a non-collusive bidding certification on Contractor's behalf.

8. INTERNATIONAL BOYCOTT PROHIBITION. In accordance with Section 220-f of the Labor Law and Section 139-h of the State Finance Law, if this contract exceeds $5,000, the Contractor agrees, as a material condition of the contract, that neither the Contractor nor any substantially owned or affiliated person, firm, partnership or corporation has participated, is participating, or shall participate in an

international boycott in violation of the federal Export Administration Act of 1979 (50 USC App. Sections 2401 et seq.) or regulations thereunder. If such Contractor, or any of the aforesaid affiliates of Contractor, is convicted or is otherwise found to have violated said laws or regulations upon the final determination of the United States Commerce Department or any other appropriate agency of the United States subsequent to the contract's execution, such contract, amendment or modification thereto shall be rendered forfeit and void. The Contractor shall so notify the State Comptroller within five (5) business days of such conviction, determination or disposition of appeal (2 NYCRR § 105.4).

9. SET-OFF RIGHTS. The State and the Fund shall have all common law, equitable and statutory rights of set-off. These rights shall include, but not be limited to, the State's and the Fund's option to withhold for the purposes of set-off any moneys due to the Contractor under this contract up to any amounts due and owing to the State or the Fund with regard to this contract or any other Fund contract, as well as any other contract with any State department or agency, including any contract for a term commencing prior to the term of this contract, plus any amounts due and owing to the State or the Fund for any other reason including, without limitation, tax delinquencies, fee delinquencies or monetary penalties relative thereto. The State and the Fund shall exercise their set-off rights in accordance with normal State practices including, in cases of set-off pursuant to an audit, the finalization of such audit by the State, the Fund, its representatives, or the State Comptroller.

10. RECORDS. The Contractor shall establish and maintain complete and accurate books, records, documents, accounts and other evidence directly pertinent to performance under this contract (hereinafter, collectively, the "Records"). The Records must be kept for the balance of the calendar year in which they were made and for six (6) additional years thereafter. The State Comptroller, the Attorney General and any other person or entity authorized to conduct an examination, as well as the Fund and any other agencies involved in this contract, shall have access to the Records during normal business hours at an office of the Contractor within the State of New York or, if no such office is available, at a mutually agreeable and reasonable venue within the State, for the term specified above for the purposes of inspection, auditing and copying. The Fund shall take reasonable steps to protect from public disclosure any of the Records which are exempt from disclosure under Section 87 of the Public Officers Law (the "Statute") provided that: (i)

the Contractor shall timely inform an appropriate Fund official, in writing, that said Records should not be disclosed; and (ii) said Records shall be sufficiently identified; and (iii) designation of said records as exempt under the Statute is reasonable. Nothing contained herein shall diminish, or in any way adversely affect, the State's or the Fund's right to discovery in any pending or future litigation.

11. IDENTIFYING INFORMATION AND PRIVACY NOTIFICATION. (a) Identification Number(s). Every invoice or New York State Claim for Payment submitted to the Fund by a payee, for payment for the sale of goods or services or for transactions (e.g., leases, easements, licenses, etc.) related to real or personal property must include the payee's identification number. The number is any or all of the following: (i) the payee's Federal employer identification number, (ii) the payee's Federal social security number, and/or (iii) the payee's Vendor Identification Number assigned by the Statewide Financial System. Failure to include such number or numbers may delay payment. Where the payee does not have such number or numbers, the payee, on its invoice or Claim for Payment, must give the reason or reasons why the payee does not have such number or numbers.

(b) Privacy Notification. (1) The authority to request the above personal information from a seller of goods or services or a lessor of real or personal property, and the authority to maintain such information, is found in Section 5 of the State Tax Law. Disclosure of this information by the seller or lessor to the Fund or the State is mandatory. The principal purpose for which the information is collected is to enable the State to identify individuals, businesses and others who have been delinquent in filing tax returns or may have understated their tax liabilities and to generally identify persons affected by the taxes administered by the Commissioner of Taxation and Finance. The information will be used for tax administration purposes and for any other purpose authorized by law. (2) The personal information is requested by the purchasing unit of the Fund contracting to purchase the goods or services or lease the real or personal property covered by this contract or lease. The information is maintained in the Statewide Financial System by the Vendor Management Unit within the Bureau of State Expenditures, Office of the State Comptroller, 110 State Street, Albany, New York 12236.

12. EQUAL EMPLOYMENT OPPORTUNITIES FOR MINORITIES AND WOMEN. In accordance with Section 312 of the Executive Law and 5 NYCRR Part 143, if this contract is: (i) a written agreement or

purchase order instrument, providing for a total expenditure in excess of $25,000.00, whereby a contracting agency is committed to expend or does expend funds in return for labor, services, supplies, equipment, materials or any combination of the foregoing, to be performed for, or rendered or furnished to the Fund; or (ii) a written agreement in excess of $100,000.00 whereby the Fund is committed to expend or does expend funds for the acquisition, construction, demolition, replacement, major repair or renovation of real property and improvements thereon; or (iii) a written agreement in excess of $100,000.00 whereby the owner of a State assisted housing project is committed to expend or does expend funds for the acquisition, construction, demolition, replacement, major repair or renovation of real property and improvements thereon for such project, then the following shall apply and by signing this agreement the Contractor certifies and affirms that it is Contractor's equal employment opportunity policy that:

(a) The Contractor will not discriminate against employees or applicants for employment because of race, creed, color, national origin, sex, age, disability or marital status, shall make and document its conscientious and active efforts to employ and utilize minority group members and women in its work force on State contracts and will undertake or continue existing programs of affirmative action to ensure that minority group members and women are afforded equal employment opportunities without discrimination. Affirmative action shall mean recruitment, employment, job assignment, promotion, upgradings, demotion, transfer, layoff, or termination and rates of pay or other forms of compensation;

(b) at the Fund's request, the Contractor shall request each employment agency, labor union, or authorized representative of workers with which it has a collective bargaining or other agreement or understanding, to furnish a written statement that such employment agency, labor union or representative will not discriminate on the basis of race, creed, color, national origin, sex, age, disability or marital status and that such union or representative will affirmatively cooperate in the implementation of the Contractor's obligations herein; and

(c) the Contractor shall state, in all solicitations or advertisements for employees, that, in the performance of the State contract, all qualified applicants will be afforded equal employment opportunities without discrimination because of race, creed, color, national origin, sex, age, disability or marital status.

Contractor will include the provisions of "a," "b," and "c" above, in every subcontract over $25,000.00 for the construction, demolition, replacement, major repair, renovation, planning or design of real property and improvements thereon (the "Work") except where the Work is for the beneficial use of the Contractor. Section 312 does not apply to: (i) work, goods or services unrelated to this contract; or (ii) employment outside New York State. The State and the Fund shall consider compliance by a contractor or subcontractor with the requirements of any federal law concerning equal employment opportunity which effectuates the purpose of this clause. The Fund shall determine whether the imposition of the requirements of the provisions hereof duplicate or conflict with any such federal law and if such duplication or conflict exists, the Fund shall waive the applicability of Section 312 to the extent of such duplication or conflict. Contractor will comply with all duly promulgated and lawful rules and regulations of the Department of Economic Development's Division of Minority and Women's Business Development pertaining hereto.

13. CONFLICTING TERMS. In the event of a conflict between the terms of the contract (including any and all attachments thereto and amendments thereof) and the terms of this Appendix A, the terms of this Appendix A shall control.

14. GOVERNING LAW. This contract shall be governed by the laws of the State of New York except where the Federal supremacy clause requires otherwise.

15. LATE PAYMENT. Timeliness of payment and any interest to be paid to Contractor for late payment shall be governed by Article 11-A of the State Finance Law to the extent required by law. For the purposes of Article 11-A of the State Finance law, the Controller's Office of the State University Construction Fund, whose mailing address is the H. Carl McCall SUNY Building, 353 Broadway, Albany, New York 12246, is the Fund's designated payment office.

16. NO ARBITRATION. Disputes involving this contract, including the breach or alleged breach thereof, may not be submitted to binding arbitration (except where statutorily authorized), but must, instead, be heard in a court of competent jurisdiction of the State of New York.

17. SERVICE OF PROCESS. In addition to the methods of service allowed by the State Civil Practice Law & Rules ("CPLR"), Contractor hereby consents to service of process upon it by registered or certified

mail, return receipt requested. Service hereunder shall be complete upon Contractor's actual receipt of process or upon the Fund's receipt of the return thereof by the United States Postal Service as refused or undeliverable. Contractor must promptly notify the Fund, in writing, of each and every change of address to which service of process can be made. Service by the Fund to the last known address shall be sufficient. Contractor will have thirty (30) calendar days after service hereunder is complete in which to respond.

18. PROHIBITION ON PURCHASE OF TROPICAL HARDWOODS. The Contractor certifies and warrants that all wood products to be used under this contract award will be in accordance with, but not limited to, the specifications and provisions of Section 165 of the State Finance Law, (Use of Tropical Hardwoods) which prohibits purchase and use of tropical hardwoods, unless specifically exempted, by the State or any governmental agency or political subdivision or public benefit corporation. Qualification for an exemption under this law will be the responsibility of the contractor to establish to meet with the approval of the State.

In addition, when any portion of this contract involving the use of woods, whether supply or installation, is to be performed by any subcontractor, the prime Contractor will indicate and certify in the submitted bid proposal that the subcontractor has been informed and is in compliance with specifications and provisions regarding use of tropical hardwoods as detailed in Section 165 of the State Finance Law. Any such use must meet with the approval of the State and the Fund; otherwise, the bid may not be considered responsive. Under bidder certifications, proof of qualification for exemption will be the responsibility of the Contractor to meet with the approval of the State.

19. MACBRIDE FAIR EMPLOYMENT PRINCIPLES. In accordance with the MacBride Fair Employment Principles (Chapter 807 of the Laws of 1992), the Contractor hereby stipulates that the Contractor either (a) has no business operations in Northern Ireland, or (b) shall take lawful steps in good faith to conduct any business operations in Northern Ireland in accordance with the MacBride Fair Employment Principles (as described in Section 165 of the New York State Finance Law), and shall permit independent monitoring of compliance with such principles.

20. OMNIBUS PROCUREMENT ACT OF 1992. It is the policy of New York State to maximize opportunities for the participation of New York State

business enterprises, including minority- and women-owned business enterprises as bidders, subcontractors and suppliers on its procurement contracts.

Information on the availability of New York State subcontractors and suppliers is available from:

NYS Department of Economic Development
Division for Small Business and Technology Development
625 Broadway
Albany, New York 12245
Telephone: 518-292-5100

A directory of certified minority- and women-owned business enterprises is available from:

NYS Department of Economic Development
Division of Minority and Women's Business Development
633 Third Avenue, 33rd Floor
New York, NY 10017
646-846-7364
email: mwbebusinessdev@esd.ny.gov
https://ny.newnycontracts.com/FrontEnd/searchcertifieddirectory.asp

The Omnibus Procurement Act of 1992 (Chapter 844 of the Laws of 1992, codified in State Finance Law § 139-i and Public Authorities Law § 2879(3)(n)–(p)) requires that by signing this bid proposal or contract, as applicable, Contractors certify that whenever the total bid amount is greater than $1 million:

(a) The Contractor has made reasonable efforts to encourage the participation of New York State Business Enterprises as suppliers and subcontractors, including certified minority- and women-owned business enterprises, on this project, and has retained the documentation of these efforts to be provided upon request to the State;

(b) The Contractor has complied with the Federal Equal Employment Opportunity Act of 1972 (P.L. 92-261), as amended;

(c) The Contractor agrees to make reasonable efforts to provide notification to New York State residents of employment opportunities on this project through listing any such positions with the Job Service Division of the New York State Department of Labor, or providing such notification in such manner as is consistent with existing collective bargaining contracts or agreements. The Contractor agrees to document these efforts and to provide said documentation to the Fund upon request; and

(d) The Contractor acknowledges notice that the State may seek to obtain offset credits from foreign countries as a result of this contract and agrees to cooperate with the State in these efforts.

21. RECIPROCITY AND SANCTIONS PROVISIONS. Bidders are hereby notified that if their principal place of business is located in a country, nation, province, state or political subdivision that penalizes New York State vendors, and if the goods or services they offer will be substantially produced or performed outside New York State, the Omnibus Procurement Act of 1994 and 2000 amendments (Chapter 684 and Chapter 383, respectively, codified in State Finance Law § 165(6) and Public Authorities Law § 2879(5))) require that they be denied contracts which they would otherwise obtain. NOTE: As of May 2023, the list of discriminatory jurisdictions subject to this provision includes the states of South Carolina, Alaska, West Virginia, Wyoming, Louisiana and Hawaii.

22. COMPLIANCE WITH BREACH NOTIFICATION AND DATA SECURITY LAWS. Contractor shall comply with the provisions of the New York State Information Security Breach and Notification Act (General Business Law §§ 899-aa and 899-bb and State Technology Law § 208.

23. COMPLIANCE WITH CONSULTANT DISCLOSURE LAW. If this is a contract for consulting services, defined for purposes of this requirement to include analysis, evaluation, research, training, data processing, computer programming, engineering, environmental, health, and mental health services, accounting, auditing, paralegal, legal or similar services, then, in accordance with Section 163 (4)(g) of the State Finance Law (as amended by Chapter 10 of the Laws of 2006), the Contractor shall timely, accurately and properly comply with the requirement to submit an annual employment report for the contract to the Department of Civil Service and the State Comptroller.

24. PROCUREMENT LOBBYING. To the extent this agreement is a "procurement contract" as defined by State Finance Law §§ 139-j and 139-k, by signing this agreement the contractor certifies and affirms that all disclosures made in accordance with State Finance Law §§ 139-j and 139-k are complete, true and accurate. In the event such certification is found to be intentionally false or intentionally incomplete, the Fund may terminate the agreement by providing written notification to the Contractor in accordance with the terms of the agreement.

25. CERTIFICATION OF REGISTRATION TO COLLECT SALES AND COMPENSATING USE TAX BY CERTAIN STATE CONTRACTORS, AFFILIATES AND SUBCONTRACTORS.
To the extent this agreement is a contract as defined by Tax Law § 5-a, if the contractor fails to make the certification required by Tax Law § 5-a or if during the term of the contract, the Department of Taxation and Finance or the Fund discovers that the certification, made under penalty of perjury, is false, then such failure to file or false certification shall be a material breach of this contract and this contract may be terminated, by providing written notification to the Contractor in accordance with the terms of the contract, if the Fund determines that such action is in the best interests of the State.

26. IRAN DIVESTMENT ACT. By entering into this Agreement, Contractor certifies in accordance with State Finance Law § 165-a that it is not on the "Entities Determined to be Non-Responsive Bidders/Offerers pursuant to the New York State Iran Divestment Act of 2012" ("Prohibited Entities List") posted at: https://ogs.ny.gov/iran-divestment-act-2012

Contractor further certifies that it will not utilize on this Contract any subcontractor that is identified on the Prohibited Entities List. Contractor agrees that should it seek to renew or extend this Contract, it must provide the same certification at the time the Contract is renewed or extended. Contractor also agrees that any proposed Assignee of this Contract will be required to certify that it is not on the Prohibited Entities List before the contract assignment will be approved by the Fund.

During the term of the Contract, should the Fund receive information that a person (as defined in State Finance Law § 165-a) is in violation of the above-referenced certifications, the Fund will review such information and offer the person an opportunity to respond. If the person fails to demonstrate that it has ceased its engagement in the investment activity which is in violation of the Act within 90 days after the determination of such violation, then the Fund shall take such action as may be appropriate and provided for by law, rule, or contract, including, but not limited to, imposing sanctions, seeking compliance, recovering damages, or declaring the Contractor in default.
The Fund reserves the right to reject any bid, request for assignment, renewal or extension for an entity that appears on the Prohibited Entities List prior to the award, assignment, renewal or extension of a contract, and to pursue a responsibility review with respect to any entity that is awarded a contract and appears on the Prohibited Entities list after contract award.

27. ADMISSIBILITY OF REPRODUCTION OF CONTRACT. Notwithstanding the best evidence rule or any other legal principle or rule of evidence to the contrary, the Contractor acknowledges and agrees that it waives any and all objections to the admissibility into evidence at any court proceeding or to the use at any examination before trial of an electronic reproduction of this contract, in the form approved by the State Comptroller, if such approval was required, regardless of whether the original of said contract is in existence.

SCHEDULE I Unit Prices

Refer to Section 4.04 of the Agreement for additional information.

Work or Material Description	Amount in Words	Amount in Figures

SCHEDULE II Allowance(s)

Refer to Section 4.05 of the Agreement for additional information. The amount(s) indicated below shall be included in the Total Bid amount and their total indicated on the Proposal in the space provided.

Work or Material Description	Amount in Words	Amount in Figures

SCHEDULE III Field Order Allowance

Refer to Section 4.05A of the Agreement for additional information. The amount indicated below shall be included in the Total Bid amount and indicated on the Proposal in the space provided.

_____ _____
(in words) (in figures)

SUNY State University Construction Fund

Insurance Requirements
Schedule A

Project: 081056 - 00- Renovate Peregrine Dining Hall
Contract Type: Construction - Full Service

All certificate(s) of Insurance/Acord Form must be submitted pursuant to Contract Article 5.06 and include the following information:

- For each insurance certificate, the name and NAIC number of issuing company, number of policy, with effective dates and deductibles, if applicable
- Policy limits consistent with the requirements listed below
- Certificate must disclose the policies are on a primary and non-contributory basis
- The contract/project number assigned by the Fund
- Carriers must meet the following criteria:(1) AM Best Company rating of A- or greater, (2) financial score of VII or greater

	Policy Limits				
Insurance Type	**Per Occurrence**	**Per Aggregate**	**Products & CO**	**Minimum Limits and Special Conditions**	**Forms**
Worker's Compensation	As required by NYS			Statutory per New York State laws without regard to jurisdiction. Waiver of Subrogation is required.	Form C105.2 (Certificate of NYS Workers' Compensation Coverage) or the U-26.3 (State Insurance Fund Certificate)
Disability	As required by NYS			Statutory per New York State laws without regard to jurisdiction.	Form DB120.1 (Certificate of Insurance Coverage under the NYS Disability Benefits Law).
General Liability	5,000,000	5,000,000	5,000,000	General Aggregate limit must apply per project.	Accord 25 and Certificate of Liability Addendum Acord 855
Automobile	1,000,000				
Builder's Risk	To Be Determined				State University Construction Fund, the contractor, and its subcontractors to be added a Named Insured.

	Contract Additional Insurance				
Insurance Type	**Per Occurrence**	**Per Aggregate**	**Products & CO**	**Minimum Limits and Special Conditions**	**Forms**
Pollution (Asbestos)	2,000,000	2,000,000			Accord 25 certificate and endorsements the endorsement may be replaced with the CG 20 38 or its equivalent.

State University Construction Fund

Insurance Requirements
Schedule A

Project: 081056 - 00- Renovate Peregrine Dining Hall
Contract Type: Construction - Full Service

Additional Insured for each liability insurance policy, including coverage for on-going and completed operations:

- The People of the State of New York
- The State University of New York
- The Dormitory Authority of the State of New York
- The State University Construction Fund
- The Campus
- Construction Manager: **Schoolhouse Construction Services, LLC**
- If applicable, Railroad
- The officers, agents, and employees of those listed above
- If applicable, non-state landowner impacted by this work

Guidance to Submit Insurance Certificates

- Certificates must be signed.
- Acord forms must be emailed directly by the agent or carrier.
- Email certificates and other insurance related correspondence to sucf.insurance@suny.edu.
- Include in the subject line the SUCF contract number or project number.
- Please do not mail additional copies to the Fund.

Report Notes: Construction Manager must be listed as additionally insured

LABOR AND MATERIAL BOND

KNOW ALL PERSONS BY THESE PRESENTS, that

(hereinafter called the "Principal") and

(hereinafter called the "Surety") are held and firmly bound to the State University Construction Fund (hereinafter called the "Fund") in the full and just sum of

dollars ($)

good and lawful money of the United States of America, for the payment of which sum of money, well and truly to be made and done, the Principal binds itself, its heirs, executors, administrators, successors and assigns and the Surety binds itself, its successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract bearing date on the

day of , 20 ,

with the Fund for the

a copy of which Contract is annexed to and hereby made a part of this Bond as though herein set forth in full; and

WHEREAS, the Fund has required this Bond guaranteeing prompt payment of monies due to all persons furnishing the Principal or any subcontractor of the Principal with labor or materials in the prosecution of the work provided in such Contract;

NOW, THEREFORE, the conditions of this obligation are such that if the Principal shall

promptly pay all monies due to all persons furnishing the Principal or any subcontractor of the Principal with labor or materials in the prosecution of the Contract, then this obligation shall be null and void, otherwise to remain in full force and effect.

PROVIDED, HOWEVER, the said Surety, for value received, hereby stipulates and agrees that no change, extension, alteration or addition to the terms of the said Contract or Specifications accompanying the same, shall in any way affect its obligations under this Bond, and it does hereby waive notice of any such change, extension, alteration or addition; and further.

PROVIDED, HOWEVER, the place of trial of any action on this Bond shall be in the county in which the said Contract was to be performed, or if said Contract was to be performed in more than one county, then in any such county, and not elsewhere; and further

PROVIDED, HOWEVER, this Bond shall be enforceable in accordance with the terms and provisions of Section 137 of the State Finance Law.

IN WITNESS WHEREOF, the Principal has hereunto set its hand and seal and the Surety has caused this instrument to be signed by its attorney-in-fact and its corporate seal to be hereto affixed this

day of ,20 .

_____
Principal

By _____

(If Corporation, affix corporate seal)

_____
Surety

By_____

(If Corporation, affix corporate seal)

PERFORMANCE BOND

KNOW ALL PERSONS BY THESE PRESENTS, that

(hereinafter called the "Principal") and

(hereinafter called the "Surety") are held and firmly bound to the State University Construction Fund (hereinafter called the "Fund") in the full and just sum of

dollars ($)

good and lawful money of the United States of America, for the payment of which sum of money, well and truly to be made and done, the Principal binds itself, its heirs, executors, administrators, successors and assigns and the Surety binds itself, its successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written Contract bearing date on the day of , 20 , with the Fund for the

a copy of which Contract is annexed to and hereby made part of this Bond as though herein set forth in full; and

NOW, THEREFORE, the conditions of this obligation are such that if the Principal, its representatives or assigns, shall well and faithfully comply with and perform all the terms, convenants and conditions of said Contract on its part to be kept and performed and all modifications, amendments, additions and alterations thereto that may hereafter be made, according to the true intent and meaning of said Contract, including repair and/or replacement of defective work and guarantees of maintenance for the periods stated in the Contract, and shall fully indemnify and save harmless the Fund from all cost and damage which it may suffer by reason of failure to do so, and shall fully reimburse and repay the Fund for all outlay and expense which the Fund may incur in making good any such default, and shall protect the said Fund against, and pay any and all amounts, damages, costs and judgments which may or shall be recovered against said Fund or its trustees, officers, agents or employees or which the said Fund may be called upon to pay to any person or corporation by reason of any damages arising or growing out of the doing of said work, or the repair of maintenance thereof, or the manner of doing the same, or the neglect of the said Principal, or its agents, or the improper performance of the said work by the said Principal, or its agents, or the infringement of any patent or patent rights by reason of the use of any materials furnished or work done as aforesaid or otherwise, then this obligation shall be null and void, otherwise to remain in full force and effect;

PROVIDED, HOWEVER, the said Surety, for value received, hereby stipulates and agrees, if requested to do so by the Fund, to fully perform and complete the work mentioned and described in said Contract, pursuant to the terms, conditions, and convenants thereof, if for any cause the Principal fails or neglects to so fully perform and complete such work and the Surety further agrees to commence such work of completion within ten (10) calendar days after written notice thereof from the Fund and to complete such work within 10 (10) calendar days from the expiration of the time allowed the Principal in the Contract for the completion thereof; and further

PROVIDED, HOWEVER, the Surety, for value received, for itself and its successors and assigns, hereby stipulates and agrees that the obligation of said Surety and its Bond shall be in no way impaired or affected by an extension of time, modification, omission, addition, or change in or to the said Contract or the work to be performed thereunder, or by any payment thereunder before the time required therein, or by any waiver of any provisions thereof, or by any assignment, subletting or other transfer of any work to be performed or any monies due or to become due thereunder or by the Fund's takeover, use, occupancy or operation of any part or all of the work covered by the Contract; and said Surety does hereby waive notice of any and all of such extensions, modifications, omissions, additions, changes, payments, waivers, assignments, subcontracts, transfers, takeovers, uses, occupancies or operations, and hereby expressly stipulates and agrees that any and all things done and omitted to be done by and in relation to assignees, subcontractors, and other transferees shall have the same effect as to said Surety as though done or omitted to be done by or in relation to said Principal.

IN WITNESS WHEREOF, the Principal has hereunto set its hand and seal and the Surety has caused this instrument to be signed by its attorney-in-fact, and its corporate seal to be hereunto affixed this day of , 20 .

_____
Principal

By _____

(If Corporation, affix corporate seal)

_____

Surety

By _____

(If Corporation, affix corporate seal)

ACKNOWLEDGMENTS FOR BONDS

(ACKNOWLEDGMENT BY PRINCIPAL, UNLESS IT BE A CORPORATION)

STATE OF)
) ss.:
COUNTY OF)

On this_____day of_____, 20_____, before me personally came

_____, to me known and known to me to be the person(s) described in and who executed the foregoing instrument and acknowledged that he executed the same.

_____
Notary Public

(ACKNOWLEDGMENT BY PRINCIPAL, IF A CORPORATION)

STATE OF)
) ss.:
COUNTY OF)

On this_____day of_____, 20_____, before me personally came

_____, to me known who, being by me

duly sworn, did depose and say that he resides in_____;

that he is the_____of the

_____, the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that is was so affixed by order of the Board of Directors of said corporation and that he signed h name thereto by like order.

_____
Notary Public

(ACKNOWLEDGMENT BY SURETY COMPANY)

STATE OF)
) ss.:
COUNTY OF)

On this_____day of_____, 20_____, before me personally came

_____, to me known who, being by me

duly sworn, did depose and say that he resides in_____;

that he is the_____of the_____, the corporation described in and which executed the foregoing instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that is was so affixed by order of the Board of Directors of said corporation and that he signed h name thereto by like order; and that the liabilities of said company do not exceed its assets as ascertained in the manner provided by the laws of the State of New York.

_____
Notary Public

SECTION 00 73 43 - Wage Rate Requirements

Wage Rates and Supplements

The following are the rates of wages and supplements determined by the Industrial Commissioner of the State of New York as prevailing in the locality of the site at which the work will be performed:

SUNY New Paltz

Peregrine Dining Hall

Southside Loop,

New Paltz, NY 12561

PRC#: 2024013717

*Effective 7/1/01, NYSDOL stopped providing individually printed copies of the **updated** schedules on existing contracts. Updated schedules may be obtained on the NYSDOL website:*

https://apps.labor.ny.gov/wpp/publicViewProject.do?method=showIt&id=1578983

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PROJECT LABOR AGREEMENT FOR THE

STATE UNIVERSITY CONSTRUCTION FUND

PROJECT NUMBER 081056 RENOVATE

PEREGRINE DINING HALL BLDG NO. 032 AT

STATE UNIVERSITY COLLEGE AT NEW

PALTZ

July 12, 2026

THE SUCF PROJECT 081056 RENOVATE PEREGRINE DINING HALL BLDG NO. 032 STATE UNIVERSITY COLLEGE AT NEW PALTZ PROJECT LABOR AGREEMENT

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PROJECT LABOR AGREEMENT

PREAMBLE

WHEREAS, The State University Construction Fund ("SUCF") desires to provide for the cost efficient, safe, quality, and timely completion of THE SUCF PROJECT 081056 RENOVATE PEREGRINE DINING HALL BLDG NO. 032 STATE UNIVERSITY COLLEGE AT NEW PALTZ PROJECT in a manner designed to afford the lowest reasonable costs to and component districts, and the committee they represent, and the advancement of permissible statutory objectives;

WHEREAS, SUCF engaged Arace & Company Group ("Arace") to undertake a study of which a copy is on file with whether the use of a Project Labor Agreement will best serve SUCF's interest in obtaining the best work at the lowest possible price, preventing favoritism, fraud and corruption, and other considerations such as the impact of delay, the possibility of cost saving advantages, ensure local labor, and any local history of labor unrest; and

WHEREAS, the Arace report dated January 2025, (the "Study"), concluded that use of a Project Labor Agreement would provide SUCF with measurable economic benefits and would promote The Region's interest in obtaining the best work at the lowest prices as well as preventing favoritism, fraud and corruption; and

WHEREAS, SUCF has carefully reviewed and considered the Study and determined, among other things, that SUCF interest in obtaining the best work at the lowest possible price, preventing favoritism, fraud and corruption, preventing the impact of delay owing to labor unrest, obtaining cost savings advantages, and gaining measurable management flexibility and benefits are best met by requiring a Project Labor Agreement and, therefore, directs that a Project Labor Agreement be made part of the Project; and

WHEREAS, this Project Labor Agreement will foster the achievement of these goals, inter alia, by:

(1) expediting the construction process and otherwise minimizing the disruption to the project;

(2) avoiding the costly delays of potential strikes, slowdowns, and walkouts arising from work disputes and promoting labor harmony and peace for the duration of the project;

(3) standardizing the terms and conditions governing the employment of labor on the project;

(4) permitting flexibility in work scheduling where necessary at affordable pay rates;

(5) permitting adjustments to work rules and staffing requirements from those which otherwise might apply;

(6) providing comprehensive and standardized mechanisms for the settlement of work disputes, including those relating to jurisdiction;

(7) promoting work opportunities for those within THE REGION and surrounding areas.

(8) ensuring a reliable source of skilled and experienced labor;

(9) Furthering public policy objectives as to improve employment opportunities in the construction industry for residents, minorities, women and the economically disadvantaged;

(10) Complying with the goals established under Article 15-a and Article 3 of the Veteran's Services Law;

(11) Encouraging the development of pathways to construction careers; and

WHEREAS, SUCF, has, through independent investigation and analysis, determined the likelihood of substantial cost savings to the Project will result from the application of this Agreement; and

WHEREAS, the Hudson Valley Building & Construction Trades Council, and its affiliated Local Unions and their members, desire to provide for stability, security and work opportunities which are afforded by a Project Labor Agreement; and others; and

WHEREAS, the Parties desire to maximize project safety conditions for both workers and others;

NOW, THEREFORE, the Parties enter into this Agreement:

I. ARTICLE 1 - PARTIES TO THE AGREEMENT

SECTION 1.1 PARTIES TO THE AGREEMENT

This is a Project Labor Agreement ("Agreement") entered into for all Project construction, as defined herein, as part of THE SUCF PROJECT 081056 RENOVATE PEREGRINE DINING HALL BLDG NO. 032 STATE UNIVERSITY COLLEGE AT NEW PALTZ PROJECT (as defined in Article 3 below) between (1) Construction Manager Schoolhouse Construction Services (2) Hudson Valley Building and Construction Trades Council ("Council") on behalf of itself and its affiliated Local Unions ("Local Unions"); and the signatory Local Unions on behalf of themselves and their members.

II. ARTICLE 2 - GENERAL CONDITIONS SECTION

SECTION 2.1 DEFINITIONS

Throughout this Agreement:

(A) **"Contractor(s)"** means any contractor and subcontractors of whatever tier engaged in Project Work within the scope of this Agreement as defined in Article 3, subject to exclusions defined in Section 3.3; 20.3 and 20.4.

(B) **"Council"** means the Hudson Valley Building & Construction Trades Council, AFL-CIO.

(C) **"Local Union(s)"** means the Local Unions signatory to this Agreement, individually and collectively.

(D) **"Owner"** means The State University Construction Fund ("SUCF") -

(E) **"Campus"** means the State University of New York at New Paltz.

(F) **"Owner's Representative"** means any Construction Manager, or Clerk of the Works, or other individual or entity designated by the Owner to enter into this Agreement or otherwise act on its behalf.

(G) **"The Project"** means the work to be performed in connection with all construction associated with THE SUCF PROJECT 081056 RENOVATE PEREGRINE DINING HALL BLDG NO. 032 STATE UNIVERSITY COLLEGE AT NEW PALTZ PROJECT at SUNY New Paltz Campus as more fully set forth in Article 3, Section 3.1, subject to exclusions defined in Sections 3.3, 20.3 and 20.4.

(H) **"Project Work"** means the work covered by this Agreement and fully defined in Article 3, Section 3.1, subject to exclusions defined in Section 3.3; 20.3 and 20.4.

(I) **"Schedule A"** means and refers to collective bargaining agreements of affiliated Local Unions.

(J) **"Union Parties"** and **"Unions"** means the Hudson Valley Building & Construction Trades Council, AFL-CIO and the signatory Local Unions to this Agreement, individually and collectively.

SECTION 2.2 CONDITIONS FOR AGREEMENT TO BECOME EFFECTIVE

This Agreement shall not become effective unless each of the following conditions are met: (1) the Agreement is signed by the Council and the Local Unions having jurisdiction over the Project Work; (2) the Agreement is approved by the NYS Building & Construction Trades Council (NYSBCTC); (3) the Agreement is approved by the NABTU; (4) the Agreement is signed by the Prime Contractor and the Construction Manager.

SECTION 2.3 ENTITIES BOUND & ADMINISTRATION OF AGREEMENT

This Agreement shall be binding on all signatory Unions and their affiliates and all Contractors performing Project Work as defined in Article 3, subject to exceptions in Sections 3.3, 20.3 and 20.4. The Contractors shall include in any subcontract that they let for performance during the term of this Agreement a requirement that their Subcontractors, of whatever tier, become bound by this Agreement with respect to that subcontracted Project Work performed within the scope of Article 3, and require that each Subcontractor, of whatever tier, sign a Letter of Assent (Schedule B). This Agreement shall be administered by the Designee named by the Owner pursuant to Schedule C.

SECTION 2.4 SUPREMACY CLAUSE

This Agreement, together with the local Collective Bargaining Agreements appended hereto and referred to herein as "Schedule A" represents the complete understanding with respect to the Project and supersedes any national agreement, local agreement, or other collective bargaining agreement of any type which would otherwise apply to Project Work, in whole or in part except that, to the NTL Articles of Agreement, the National Stack/Chimney Agreement, the National Cooling Tower Agreement, the UA/IBEW Joint National Agreement for Instrument and Control Systems Technicians, and the National Agreement of the International Union of Elevator Constructors (the "National Agreements"), those National Agreements shall apply, except that when Contractor is also a signatory to an agreement listed in Schedule A hereof, Articles 7, 9, and 10 of this Agreement shall prevail over the applicable National Agreement and any Schedule A agreement . Where a subject covered by the provisions of this Agreement is also covered by a Schedule A agreement, the provisions of this Agreement shall prevail. If this Agreement is silent on any matter addressed in the applicable Schedule A agreement, the Schedule A agreement shall govern. It is understood that by virtue of having become bound by this Project Labor Agreement, the Contractors will not be obligated to sign any other local, area, or national agreement.

SECTION 2.5 LIABILITY

The liability of any Contractor and the liability of any Union under this Agreement shall be several and not joint. The Contractors, and Subcontractors shall not be liable for any violations of this Agreement by any other Contractor or Subcontractor; and the Council and Local Unions shall not be liable for any violations of this Agreement by any other Union. Notwithstanding the above, every signatory to the Agreement further acknowledges that it will be liable for its own breach, partial breach or otherwise, whether related or not to the breach of another signatory.

SECTION 2.6 THE BID SPECIFICATIONS

The Owner shall require in its bid specifications for all Project Work within the scope of Article 3 that all successful bidders and their Subcontractors of whatever tier (unless otherwise excepted under this Agreement) become bound by this Agreement. Every Contractor shall require its Subcontractors, of whatever tier, to execute the Letter of Assent in Schedule B and to become bound by this Agreement.

SECTION 2.7 AVAILABILITY AND APPLICABILITY TO ALL SUCCESSFUL BIDDERS

This Agreement shall be binding on all signatory Unions and their affiliates, and all Contractors, Unions and/or non-Unions performing Project Work, unless otherwise excepted under this Agreement. Unless expressly provided for in this Agreement, this Agreement shall not apply to the work of any Contractor which is performed at any location other than the site of Project Work.

III. ARTICLE 3 - SCOPE OF THE AGREEMENT

SECTION 3.1 PROJECT WORK

This Agreement shall only apply to Project Work as defined in this Article.

Subject to the exclusions in this Article, Project Work means solely that work performed in connection with all construction associated with THE SUCF PROJECT 081056 RENOVATE PEREGRINE DINING HALL BLDG NO. 032 STATE UNIVERSITY COLLEGE AT NEW PALTZ PROJECT. Project Work, unless otherwise excepted under Sections 3.3, 20.3 or 20.4, shall include all sitework, utilities, demolition, environmental work, MEP's and all construction related to THE SUCF PROJECT 081056 RENOVATE PEREGRINE DINING HALL BLDG NO. 032 STATE UNIVERSITY COLLEGE AT NEW PALTZ PROJECT:

SECTION 3.2 TIME LIMITATIONS

A. To be covered by this Agreement, Project Work must be awarded after the effective date of this Agreement.

B. This Agreement shall expire upon completion and acceptance by the Owner of the Project.

C. This Agreement may be extended by written mutual agreement of the parties.

SECTION 3.3 EXCLUDED EMPLOYEES

Notwithstanding the provisions of Section 3.1 of this Article, the following person/entities are not subject to the provisions of this Agreement even though performing work on or in connection with the Project:

A. Superintendents, supervisors (excluding general and forepersons specifically covered by a craft's Schedule A), engineers, inspectors and testers, quality control/assurance personnel, timekeepers, mail carriers, clerks, office workers, messengers, guards (not covered by schedule A) employed by Owner, technicians, non-manual employees, and all professional, engineering (except field surveyors), administrative and management persons;

B. Employees of the Owner including employees of the State University Construction Fund or the State University of New York, the campus on which the work is occurring, employees of any campus-affiliated entity, and any other municipal or State Authority, agency or entity, or the employees of any other public employer, even though performing other work on the Project site while covered project work is underway.

C. Employees and entities engaged in off-site manufacture, modifications, repairs, maintenance, or painting, handling or fabrication of project components, materials, equipment, or machinery except where such work is lawfully included in a Schedule A CBA, or where such work is lawfully included in Section 220 of the New York State Labor Law.

D. Employees of the Prime Contractor or Construction Manager, if one, except those performing manual, onsite construction labor who will be covered by this Agreement.

E. Employees engaged in onsite equipment warranty work;

F. Employees engaged in geophysical testing (whether land or water) other than boring for core samples;

G. Employees engaged in laboratory, specialty testing, inspections, and commissioning pursuant to a professional services agreement between the Owner, Campus, orConstruction Manager, or any of the Owner's professional consultants.

H. Employees engaged in ancillary Project Work performed by third parties such as electric utilities, gas utilities, telephone companies, and railroads. Utility work provided by gas, electric, and cable companies, which is not performed by utility company employees, shall be subject to the terms of this Agreement.

I. Employees and entities engaged in the manufacturing, design, handling or pre-fabrication of the pre-engineered metal building for the project. Erection of such shall be covered work.

J. Employees and entities engaged in the hauling, removing unsuitable earth, concrete, spoilage and materials, except such work that is covered under NYS Labor Law 220 which shall be covered under this agreement.

See Article 20 for project specific excluded and included work for clarification.

IV. ARTICLE 4 - UNION RECOGNITION AND EMPLOYMENT

SECTION 4.1 PRE-HIRE RECOGNITION

The Contractors recognize the signatory Unions as the sole and exclusive bargaining representatives of all craft employees who are performing Project Work within the scope of Article 3 of this Agreement.

SECTION 4.2 UNION REFERRAL

A. The Contractors agree to hire craft employees for Project Work covered by this Agreement through the job referral systems and hiring halls established in the Local Unions' area collective bargaining agreements (attached as Schedule A to this Agreement), where those referrals meet the qualifications set forth in items 1, 2, and 4 of subparagraph B. The Unions agree to provide such craft employees (including apprentices) to all Contractors on a non-discriminatory basis. Notwithstanding this, Contractors shall have sole right to determine the competency of all referrals; the number of employees required; and the selection of employees for layoff (subject to Article 5, Section 5.3) and the sole right to reject any applicant referred by a Local Union, subject to any required show up allowance. In the event that a Local Union is unable to fill any request for qualified employees within a 48-hour period after such

requisition is made by a Contractor (Saturdays, Sundays and holidays excepted), a Contractor may employ qualified applicants from any other available source and notwithstanding the 12.5% limitation as set forth in paragraph B below. In the event that the Local Union does not have a job referral system, the Contractor shall give the Local Union first preference to refer applicants, subject to the other provisions of this Article. The Contractor shall notify the Local Union of craft employees hired for Project Work within its jurisdiction from any source other than referral by the Union. The Local Unions will cooperate with Contractor requests for minority, women, or economically disadvantaged referrals to meet the goals of Article 4, Section 4.4. These workers may be delivered under a "Direct Entry" designation or by use of a Department of Labor waiver.

B. A Contractor may request by name, and the Local Union will honor, referral of persons who have applied to the Local Union for Project Work and who meet the following qualifications:

(1) Possess any license required by New York State law for the Project Work to be performed;

(2) Have worked a total of at least 1000 hours in the construction craft during the prior two years, and

(3) Were on the Contractor's active payroll for at least 60 out of the 180 calendar days prior to the contract award.

(4) Have the ability to safely perform the basic functions of the applicable trade.

C. Notwithstanding (F) of article 4.2. No more than twelve and a half (12.5%) per centum of the employees covered by this Agreement, per Contractor by craft, shall be hired through the provisions of Paragraph B of this section (any fraction shall be rounded to the next highest whole number). Craft forepersons and/or general forepersons shall be included in these twelve and a half (12.5%) percent. If requested by the appropriate Union, a Contractor utilizing this provision for by- name referrals shall furnish the Union with a written certification that the individuals requested for referral meet the requirements of (1) - (5) above.The Local Unions shall exert their utmost efforts to recruit sufficient numbers of skilled craft workers to fulfill the manpower requirements of the Contractor. When a Contractor of any tier is contracted to perform Project Work and such Contractor

is not signatory to a Schedule A agreement (not including signatory through this Agreement) and the Union cannot provide ample labor to support the construction schedule or project, then the Contractor shall hire outside the Union hiring halls and the Contractor shall, at their discretion, replace the non-Union or non-dispatched employee when notified by the Union that labor has become available through the Union. The Contractor shall use other employees affiliated with the Council before

hiring except, where specifically addressed in this Agreement if those employees from the other Unions have the required trade skills to perform the Project Work. Those hired through this provision shall be laid off before those of an affiliated Union.

D. Notwithstanding the foregoing, SUCF or a representative of, shall have the sole discretion to request that a person be removed from working on this Project.

E. Notwithstanding Article 4, Section 2 of the PLA, or any provision of that agreement, and to the full extent permitted by law, a Contractor may designate subcontractors who have been identified in the Contractor's approved (and amendments to) Minority/Women Business Enterprise and Service Disabled Veteran Owned Business Utilization Plan and whose subcontracts for Project Work as defined in Article 3 are equal to or less than, in aggregate for any given subcontractor, one-million ($1,000,000) as exempt from the hiring hall referral procedure of Article 4, Section 2, and instead that subcontractor may hire per craft, one (1) employee who is referred by the applicable trade or craft and then one employee that is employed by the subcontractor. The subcontractor shall repeat the process of hiring one employee referred by the applicable trade or craft followed by one employee of the subcontractor until the crew requirements for that craft are met, up to a total crew size of 8 in which time the tag along for the remainder of hires shall be 12.5%.

SECTION 4.3 NON-DISCRIMINATION IN REFERRALS

A. The Local Unions represent that their hiring halls and referral systems shall be operated in a non-discriminatory manner and in full compliance with all applicable federal, state and local laws and regulations which require equal employment opportunities. Referrals shall not be affected in any way by the rules, regulations, bylaws, constitutional provisions or any other aspects or obligations of Union membership, policies, or requirements and shall be subject to such other conditions as are established in this Article. No employment applicant shall be discriminated against by any referral system or hiring hall because of the applicant's Union membership, or lack thereof.

SECTION 4.4 WORKFORCE DIVERSITY UTILIZATION

The Unions recognize and acknowledge that workforce diversity of minorities and women are employment goals consistent with our values of fair play. The Local Unions agree and will strive to achieve that 6 percent of all referrals consist of minorities and 3 percent of all referrals consist of women. In the event that a Local Union either fails or is unable, to refer qualifiedminority or female applicants in percentages equaling the diverse workforce goals, the Contractor shall make a good faith effort to employ minority or female applicants from any available sources.

SECTION 4.5 CROSS AND QUALIFIED REFERRALS

The Local Unions shall not knowingly refer to a Contractor an employee then employed by

another Contractor working under this Agreement. The Local Unions shall exert their utmost efforts to recruit sufficient numbers of skilled and qualified crafts employees to fulfill the requirements of each Contractor.

SECTION 4.6 UNION DUES

Nothing in this Agreement requires employees to join a Union or pay dues or fees to a Union as a condition of working on the Project. This Agreement is not, however, intended to supersede independent requirements in applicable Local Union Agreements as to Contractors that are otherwise signatory to those Agreements in relation to employees of such Contractors performing Project Work.

V. ARTICLE 5 - UNION REPRESENTATION

SECTION 5.1 LOCAL UNION REPRESENTATIVE

Each Local Union signatory to this Agreement shall be entitled to designate a representative and/or Business Manager who shall be afforded access to the Project site only during times when Project Work is being conducted.

SECTION 5.2 STEWARDS

A. Each Local Union shall have the right to designate from among those referred to the Project a working journey person as a Steward or Lead Engineer per shift, and shall notify the Construction Manager or Clerk of Works if applicable, or general contractor, of the identity of the designated Steward or Lead Engineer (and alternate) prior to the assumption of such duties. Stewards or Lead Engineer shall not exercise supervisory functions and shall receive the rate of pay for their craft classifications as posted in Schedule A. There will be no non-working Stewards or Lead Engineer on the Project.

B. In addition to his/her work as an employee, the Steward or Lead Engineer shall have the right to receive complaints or grievances and to discuss and assist in their adjustment with the Contractor's appropriate supervisor; such activities, however, are not to interfere with the Steward's work unless an emergency situation exists. Each Steward or Lead Engineer shall be concerned with the employees of the Steward's Contractor and, if applicable, Subcontractors of that Contractor, but notwith the employees of any other Contractor. The Contractor will not discriminate against the Steward or Lead Engineer in the proper performance of Union duties.

C. Requirements for stewards or lead engineer shall be as per the applicable Schedule A agreement.

SECTION 5.3 LAYOFF OF A STEWARD

Contractors agree to notify the appropriate Union 24 hours prior to the layoff of a Steward or Lead Engineer, except in cases of discipline or discharge for just cause. If a Steward is protected against layoff by a Schedule A agreement, such provisions shall be recognized to the extent the Steward or Lead Engineer possesses the necessary qualifications to perform the Project Work required. In any case in which a Steward or Lead Engineer is discharged or disciplined for just cause, the Local Union involved shall be notified immediately by the Contractor.

SECTION 5.4 UNION STANDARDS

A. The Council and its affiliates have a legitimate interest in preventing the undermining of the work opportunities and standards gained through collective bargaining and desire to preserve and protect work opportunities for its members.

B. Contractors, while recognizing this interest, must maintain its ability to utilize the services of off-site fabricators and those entities involved in deliveries of construction materials, except those materials included m Section 3.3, when not covered under New York State Labor Law 220.

C. While the scope of the Agreement is limited to Project Work as defined and subject to exceptions herein, Contractors should, whenever economically feasible, make reasonable efforts to use Union signatory vendors, which includes, but not limited to, UA Yellow Label and SMW Blue Label products for off-site assemblies or fabrications.

D. This Section does not refer to construction material normally purchased pre-assembled or manufactured, it references Project Work normally and historically done on-site or in Local Union fabrications shops.

E. If any dispute should arise with respect to this Section, the Contractors agree to install any off-site assemblies or fabricated items regardless of the source. The parties shall endeavor to settle such dispute in the Labor Management forum or appropriate sub-committee before a grievance is filed under Article 9.

VI. ARTICLE 6 - MANAGEMENT RIGHTS

SECTION 6.1 RESERVATION OF RIGHTS

Except as expressly limited by a specific provision of this Agreement, Contractors retain full and exclusive authority for the management of their operations including, but not limited to: the right to direct the Project Work force, including determination as to the number to be hired and the qualifications therefore; the promotion, transfer, layoff of its employees; or the discipline or discharge for just cause of its employees; the assignment and schedule of Project Work; the promulgation of reasonable Project Work rules; and the requirement, timing and number of employees to be utilized for overtime Project Work. Nothing contained herein shall be construed so as to allow direction of an Employee to perform Project Work outside the jurisdiction of that Employee's Labor Union affiliation, if any. No rules, customs, or practices which limit or restrict productivity or efficiency of the individual (as determined by the Contractor) and/or joint working efforts with other employees shall be permitted or observed.

SECTION 6.2 MATERIALS, METHODS & EQUIPMENT

A. There shall be no limitation or restriction upon the Contractor's choice of materials, techniques, methods, technology or design, or, regardless of source or location, upon the use and installation of equipment, machinery, package units, pre-cast, pre-fabricated, pre-finished, or pre-assembled materials, tools, or other labor-saving devices. Contractors may, without restriction, install or use materials, supplies or equipment regardless of their source. The on-site installation or application of such items shall be performed by the craft having jurisdiction over such Project Work pursuant to an applicable collective bargaining agreement; provided, however, it is recognized that other personnel having special qualifications may participate, in a supervisory capacity, in the installation, check-off or testing of specialized or unusual equipment or facilities as designated by the Contractor.

VII. ARTICLE 7 - WORK STOPPAGES AND LOCKOUTS SECTION

SECTION 7.1 NO STRIKES-NO LOCK OUT

There shall be no strikes, sympathy strikes, picketing, work stoppages, slowdowns, demonstrations, or other disruptive activity on Project Work site for any reason by any signatory to this Agreement. There shall be no Union or concerted or employee activity which disrupts or interferes with the Project Work. Should any employee breach this provision, the Local Unions will use their best efforts to immediately end the breach and return all employees to work. There shall be no lockout by any signatory to this Agreement.

SECTION 7.2 DISCHARGE FOR VIOLATION

A Contractor may discharge any employee violating Section 7.1, above, and any such employee will not be eligible thereafter for referral under this Agreement for a period of 100 working days.

SECTION 7.3 NOTIFICATION

If a Contractor contends that any Union has violated this Article, it shall notify the Council of such fact, with copies of the notification to the Local Union involved. The Council and Local Union shall instruct, order, and otherwise use their best efforts to cause the employee(s) to immediately cease and desist from any violation of this Article. The Council shall not be liable for the unauthorized acts of a Local Union or its members. Similarly, a Local Union and its members shall not be liable for any unauthorized acts of its members, the Council, or another Local Union.

SECTION 7.4 EXPEDITED ARBITRATION

Any Contractor or Union alleging a violation of Section 7.1 of this Article or Section 8.3(D)(2) of Article 8 may utilize the expedited procedure set forth below (in lieu of, or in addition to, any actions at law or equity) that may be brought.

A. A party invoking this procedure shall notify J. Pierson, Neal M. Eiseman and Thomas Hines, who shall alternate as Arbitrator under this expedited arbitration procedure. If the Arbitrator next on the list is not available to hear the matter within 24 hours of notice, the next Arbitrator on the list shall be called. Copies of such notification will be simultaneously sent to all parties (the alleged violator, the Council, the Local Union, the Contractor, and the Construction Manager).

B. The Arbitrator shall hold a hearing within 48 hours of receiving the notice invoking the procedure if it is contended that the violation still exists. The Arbitrator shall provide at least 24 hours' notice (excluding Sundays and holidays) to all parties as to time and place of the hearing.

C. All notices pursuant to this Article must be delivered to all parties (Local Union, Council, Contractor, alleged violator, and Owner) and may be provided by telephone, telegraph, hand delivery, fax, email, or confirmed overnight delivery. The hearing may be held on any day including Saturdays or Sundays. The hearing shall be completed in one session which shall not exceed 8 hours duration (no more than 4 hours being allowed to either side to present their case and conduct their cross examination) unless otherwise agreed. A failure of any party to attend the hearing shall not delay the hearing of evidence by those present or the issuance of an award by the Arbitrator.

D. (i) Section 7.1 hearings:

The sole issue at the hearing shall be whether a violation of Section 7.1 occurred.

If a violation is found to have occurred, the Arbitrator shall issue a Cease-and-Desist Award restraining such violation and serve copies on all parties. The Arbitrator shall have no authority to consider any matter in justification, explanation or mitigation of such violation or to award damages (any damages issue is reserved solely for court proceedings, if any). The Award shall be issued in writing within 3 hours after the close of the hearing, and may be issued without an Opinion. If any involved party desires an Opinion, one shall be issued within 15 calendar days, but its issuance shall not delay compliance with, or enforcement of, the Award.

(ii) Section 8.3(D)(2) hearings:

The sole issue at the hearing shall be whether a violation of Section 8.3(D)(ii) occurred. If a violation is found to have occurred, it shall be prima facie evidence of intentional mis-assignment, and the Arbitrator shall issue an immediate stop-work order with respect to the Project Work involved and reassign the Project Work as necessary. The Arbitrator is also authorized to (a) award damages or back pay in order to make the aggrieved trade whole, and (b) remove the offending Contractor from the job in egregious situations.

E. An Award issued under this procedure may be enforced by any court of competent jurisdiction upon the filing of this Agreement together with the Award. Notice of the filing of such enforcement proceedings shall be given to all parties. In any court proceeding to obtain a temporary or preliminary order enforcing the Arbitrator's Award as issued under this expedited procedure, the involved Union and Contractor waive their right to a hearing and agree that such proceeding may be commenced by order to show cause. Such agreement does not waive any party's right to participate in a hearing for a final court order of enforcement or in any contempt proceeding.

F. Any rights created by statute or law governing arbitration proceedings which are inconsistent with the procedure set forth in this Article, or which interfere with compliance thereto, are hereby waived by the Contractors and Unions to whom they accrue.

G. The fees and expenses of the Arbitrator shall be equally divided between the involved Contractor and Union.

SECTION 7.5 ARBITRATION OF DISCHARGES FOR VIOLATION

Procedures contained in Article 9 shall not be applicable to any alleged violation of this Article, with the single exception that an employee discharged for violation of Section 7.1, above, may have recourse to the procedures of Article 9 to determine only if the employee did, in fact,

violate the provisions of Section 7.1 of this Article; but not for the purpose of modifying the discipline imposed where a violation is found to have occurred.

VIII. ARTICLE 8 - LABOR MANAGEMENT COMMITTEE

SECTION 8.1 SUBJECTS

The Project Labor Management Committee ("Committee") will meet as established by the Committee to: 1) promote harmonious relations among the Contractors and Unions; 2) enhance safety awareness, cost effectiveness and productivity of construction operations; 3) protect the public interest; 4) discuss matters relating to staffing and scheduling with safety and productivity as considerations; 5) review Affirmative Action and equal employment opportunity matters pertaining to the Project, if any and increase work opportunity within The REGION for ~~Town~~ residents.

SECTION 8.2 COMPOSITION

The Committee shall be jointly chaired by the Council. It may include representatives of the Local Unions and Contractors involved in the issues being discussed. The Committee may conduct business through mutually agreed upon sub-committees and will be compromised of the Construction Manager and the Owner's designee. Owner has the right, but not the obligation, to participate in the Project Labor Management Committee.

SECTION 8.3 PRE-JOB CONFERENCE

A. So that the start and continuation of Project Work may progress without interruption, the Committee shall require each Contractor and Subcontractor of whatever tier to conduct a pre-job conference with the Council prior to commencing work. The Construction Manager or General Contractor shall be advised in advance of such conferences and may participate if they wish. This pre-job conference with the Council is in addition to any pre-job/pre-construction conferences required by the Project Contract Documents.

B. The purpose of the pre-job conference with the Council shall be for the parties to gain an understanding of each Contractor's proposed work assignments, the standard work day and work week, the number of employees to be employed, the method of referral, the applicable wage rates and fringe benefit contributions and any other matters in accordance with this Agreement.

C. Proposed Trade Assignments. In conjunction with the pre-job conference with the Council required by this Section, each Contractor, at the request of the Council, shall fill out a Proposed Trade Assignment identifying all Subcontractors and indicating what trades will be used to perform the Project Work. This form shall be submitted to the Council at least fourteen (14) days in advance of the commencement of Project Work. If any Local Union(s) objects to or disagrees

with the Proposed Trade Assignment of either the Contractor or Subcontractor, the Local Union will state its objection within three (3) days of the submission of the Proposed Trade Assignments and there shall be a good faith discussion among the Contractor or Subcontractor and the objecting Local Union and other affected Unions to resolve the matter. If no resolution is reached, any involved Local Union may submit their objection position in writing, together with support documentation, within seven (7) calendar days of the submission of the Proposed Trade Assignments to the Contractor or Subcontractor with a copy to all affected Local Unions. Failure of any objecting Local Union and/or other affected Unions to timely object or submit such objection positions in writing waives any objection to the Proposed Trade Assignments. The Contractor or Subcontractor will review all submitted supporting documentation regarding the Proposed Trade Assignments and will submit to the Construction Manager or Clerk of Works, the Council, and all affected Local Unions a "Final Trade Assignment" letter within fourteen (14) days calendar days of the pre-job meeting at which the Proposed Trade Assignments were made.

D. Disputes and Violations.

(1) Unresolved disputes concerning trade assignments shall be handled in accordance with Section 10.1, 10.2, and 10.3 of Article 10 in accordance with the National Plan for Settlement of Jurisdictional Dispute in the Construction Industry established by the Building and Construction Trades Department, incorporated by reference in Schedule C, provided however, that disputes concerning intra-trade assignments (assignments between trades within the same International Union) will be determined by the applicable International Union.

(2) Contractor's failure to conduct a pre-job conference with the Council, failure to include all required parties in a pre-job conference with the Council, or failure to adhere to agreed-upon Schedule D trade assignments is a violation of this Agreement and prima facie evidence of intentional mis- assignment. Alleged violations of this provision shall be considered a lock- out and subject to the expedited arbitration procedures of Article 7, Section 7.4.

(3) All remaining unresolved issues shall be subject to the provisions of Article 9.

IX. ARTICLE 9 - GRIEVANCE & ARBITRATION PROCEDURE

SECTION 9.1 CLOSE COOPERATION

The Contractors, Unions, and employees, collectively and individually, realize the importance to all parties to maintain continuous and uninterrupted performance of Project Work and agree to resolve disputes in accordance with the grievance-arbitration provisions set forth in this Article.

SECTION 9.2 PROCEDURE

Any question, dispute or claim arising during the term of this Agreement involving the interpretation or application of this Agreement (other than jurisdictional disputes and alleged violations of Section 7.1, and Section 8.3(D)(2)), shall be considered a grievance and shall be resolved pursuant to the following procedure.

Step 1:

A. When any employee covered by this Agreement feels aggrieved by a claimed violation of this Agreement, the employee shall give notice of the claimed violation to the Local Union representative or job steward, who shall notify the Project Work site representative of the involved Contractor and the Construction Manager or Clerk of Works. To be timely, such notice must be in writing given within 7 calendar days after the act, occurrence or event giving rise to the grievance. Strict compliance with this 7-day notice is a condition precedent to proceeding with such grievance. The Local Union representative or the job steward shall meet with the Project Work site representative of the involved Contractor and the Construction Manager, if applicable, and endeavor to adjust the matter within 7 calendar days after timely notice has been given. The representative of the involved Contractor shall keep the minutes of the meeting and shall respond to the Union representative in writing, with copy to the Construction Manager, within twenty-four (24) hours after the conclusion of the meeting. If they fail to resolve the matter within the prescribed period, the grieving party, may, within 7 calendar days thereafter, pursue Step 2 of the grievance procedure by serving the involved Contractor with written copies of the grievance setting forth a description of the claimed violation, the date on which the grievance occurred, and the provisions of the Agreement alleged to have been violated. Grievances and disputes settled at Step 1 are non-precedential except as to the specific Local Union, employee and Contractor directly involved, unless the settlement is accepted in writing by the Labor-Management Committee as creating a precedent with respect to Project Work.

B. Should any signatory to this Agreement have a dispute [excepting jurisdictional disputes and alleged violations of Section 7.1 or Section 8.3(D)(i) or (ii) with any other signatory to this Agreement and, if after conferring, a settlement is not reached within 7 calendar days, the dispute may be reduced to writing and the grieving party may proceed to Step 2 in the same manner as outlined in subparagraph (a) for the adjustment of employee grievances.

Step 2:

Upon timely receiving a written grievance, the involved Contractor shall notify and schedule a meeting with the Business Manager of the involved Local Union, the Council, and the Construction Manager, and their respective representatives, for the purpose of

arriving at a satisfactory settlement. Such meeting shall be held within 7 calendar days of the involved Contractor's receipt of the written grievance. Meeting minutes shall be kept by the Contractor with copies to the parties within twenty-four (24) hours.

Step 3:

A. If the grievance shall have been submitted but not resolved in Step 2, any of the participating Step 2 entities may, within 21 calendar days after the initial Step 2 meeting, submit the grievance in writing (copies to other participants, including the Construction Manager) along with copies of the minutes from Step 1 and Step 2, to the acting Arbitrator under this procedure alternating between J. Pierson, Roger Moyer and Thomas Hines. The Labor Arbitration Rules of the American Arbitration Association shall govern the conduct of the arbitration hearing, at which all Step 2 participants shall be parties. The decision of the Arbitrator shall be final and binding on the involved Contractor, Local Union, and employees, and the fees and expenses of such arbitrations shall be borne equally by the involved Contractor and Local Union.

B. Failure of the grieving party to adhere to the time limits set forth in this Article shall render the grievance null and void. These time limits may be extended only by written consent of the Construction Manager, if applicable, the involved Contractor, and the involved Local Union at the particular step where the extension is agreed upon. The Arbitrator shall have authority to make decisions only on the issues presented to him and shall not have the authority to change, add to, delete or modify any provision of this Agreement.

X. ARTICLE 10 - JURISDICTIONAL DISPUTES

SECTION 10.1 ASSIGNMENT

The assignment of Project Work shall be solely the responsibility of the Contractor performing the Project Work involved, subject to the pre-job conference with the Council and the procedures set forth in Section 8.3(C), and such Project Work assignments shall be in accordance with the National Plan for the Settlement of Jurisdictional Disputes in the Construction Industry ("National Plan"), incorporated by reference into Schedule C, or any successor Plan approved by the Building & Construction Trades Department, AFL-CIO. Where local memorandums of understanding or agreements between trades are in place they shall apply.

SECTION 10.2 PROCEDURE FOR SETTLEMENT OF JURISDICTIONAL DISPUTES

All jurisdictional disputes involving Project Work shall be settled according to the

National Plan, provided however, that disputes concerning intra-trade assignments (assignments between trades within the same International Union) will be determined by the applicable International Union.

SECTION 10.3 NO DISRUPTIONS

There will be no strikes, work stoppages, or slowdowns, arising out of any jurisdictional dispute. Pending the resolution of the dispute, the Project Work shall continue uninterrupted and as assigned by each Contractor. No jurisdictional dispute shall excuse a violation of Article 7.

SECTION 10.4 AWARD

Any jurisdictional award pursuant to this Article shall be final and binding on the disputing Unions and the involved Contractor on this Project only and may be enforced in any court of competent jurisdiction. Such award or resolution shall not establish a precedent on any other construction work not covered by this Agreement.

SECTION 10.5. LIMITATIONS

Awards made under this Article shall determine only to whom the disputed Project Work belongs. The deciding person or group hereunder shall have no authority to (a) assign Project Work to a double crew, that is, to more employees than the minimum required by the Contractor to perform the Project Work involved; (b) assign work to employees who are not qualified to perform the work involved; or (c) assign Project Work being performed by non-Union employees to Union employees. This provision does not prohibit the establishment, with the agreement of the involved Contractor, of composite crews where more than one (1) employee is needed for the job.

XI. ARTICLE 11 - WAGES AND BENEFITS

SECTION 11.1 CLASSIFICATION AND HOURLY RATE

All employees covered by this Agreement shall be classified in accordance with the work performed and paid the wage rates applicable for those classifications as required by the Schedule A applicable to the work. The term "straight time" in this Agreement shall mean the hourly wage rate applicable for those classifications as required by the applicable New York State Labor Law Section 220 ("Section 220") prevailing wage determination.

SECTION 11.2 EMPLOYEE BENEFITS

A. Unless expressly provided differently in this Agreement, Contractors agree to pay employee benefits/supplements on behalf of all of their employees covered by this Agreement in the amounts required by the applicable Section 220 schedule in

effect. Except as provided herein, the Contractors agree that such payments shall be made to those established jointly trusteed employee benefit funds designated in the applicable Schedule A agreement, and in the amounts so designated, to the extent such payments are required by and satisfy the Section 220 obligation. Bona fide jointly trusteed fringe benefit plans established or negotiated through collective bargaining during the life of this Agreement may be added if they similarly fall within Section 220. Contractors not otherwise contractually bound to do so, shall not be required to contribute to non-Section 220 benefits, trusts or plans; however, this provision does not relieve Contractors which are signatory to local collective bargaining agreements with any Local Union from complying with the benefit requirements for all funds contained in those collective bargaining agreements.

B. Notwithstanding Section l 1.2(A):

(1) Contractors who designate employees pursuant to Article 4 may satisfy the above benefits obligation with respect to those employees by: (1) providing those employees with coverage under their private benefit plans for health, welfare, pension, annuity and 40l(k); or (2) paying the full amount of such benefit to the employee in employees' wages. The total benefit payments to be made on behalf of each such employee must equal the total Section 220 benefit/supplement amount. If the Contractor's contribution into the private benefit plan for the above funds is less than the amount required by Section 220, the difference must be paid to the employee in cash. Payments of other benefits covered under Section 220 shall be paid to the respective Unions on behalf of each employee.

(2) This same option shall apply with respect to any other employee who is referred to the Contractor through the hiring hall process provided such employee was previously employed by the Contractor and was a participant in a bona fide private benefit plan maintained by the Contractor which satisfies the requirements of Section 220.

(3) The option for a private plan equivalent supplement shall not apply to contributions into Joint Apprentice Training Committee (JATC), or similar apprentice funds designated in the applicable Schedule A agreement, if the Contractor does not have an apprentice training program approved by the Department of Labor (However, all Contractors with contracts for this Project in excess of $500,000 must participate in apprenticeship training programs pursuant to New York State Labor Law §222(2)(e)). Upon request by the Council, any Contractor providing coverage under this provision will provide the Council with documentation of benefit payments made to individual employees during the term of their employment on the Project.

(4) Contractors who exercise the option under Section 11.2(B) of this Article to pay into their own private benefit plans rather than the applicable jointly trusteed funds designated in the applicable Schedule A agreement shall be responsible for and guarantee employee benefit/supplement payments and

shall indemnify and hold harmless the jointly trusteed funds designated in the applicable Schedule A agreement against any and all benefit/ supplement claims by its employees.

C. Contractors who contribute to jointly trusteed funds under this Section agree to be bound by the written terms of the legally-established jointly trusteed Trust agreements specifying the detailed basis on which payments are to be paid into, and benefits paid out of, such trust funds but only with regard to Project Work done and only for those employees for whom this Agreement requires such benefit payments. Notwithstanding the foregoing, a Contractor's liability shall be at all times limited to the amount of contributions required to be made to the Trust Funds.

D. Each Contractor shall be responsible for and guarantee the payment of all required fringe benefits on the Project. The Local Unions and/or the Council shall notify the General Contractor whenever a Contractor or Subcontractor fails to make a required benefit payment and such delinquency remain outstanding after 30 days. Notification must be in writing and may be by email. If written notice of such a delinquency is received by the General Contractor within 7 days it shall withhold from any funds due to the delinquent Contractor the amount of that delinquency, up to the total amount due, until any dispute regarding the delinquency has been resolved. The General Contractor shall have no other obligation with respect to contributions owed by any Contractor (or its Subcontractor); but that each Contractor shall continue to be obligated with respect to contributions based on Project Work done by that respective Contractor. If notice of a delinquency is not received by the General Contractor within the required time periods, General Contractor shall have no basis upon which to withhold, with respect to that delinquency, any part of a payment which is otherwise due. General Contractor shall require **Contractors to submit proof of benefit payment with pay request.**

XII. ARTICLE 12 - HOURS OF WORK, PREMIUM PAYMENTS, SHIFTS AND HOLIDAYS

SECTION 12.1 WORK WEEK AND WORK DAY

A. Unless otherwise provided for in this Agreement, the standard work week shall be five days, Monday through Friday, eight hours per day plus½ hour unpaid lunch period each day. The starting time for the standard work week shall start at either 6:00 a.m., 6:30 a.m., 7:00 a.m., 7:30 a.m. or 8:00 a.m. Multiple starting times shall be allowed.

B. Four-tens: notwithstanding any other provision of the Agreement, when working a four-day work week, the work shall consist of 4 days, Monday through Thursday, ten hours per day plus ½ hour unpaid lunch period at the straight time rate. The

starting time for four-tens shall be 6:00 a.m. 6:30 a.m. 7:00 a.m. A three-day minimal notice shall be required for four-tens to the respective involved Unions.

C. On a 5-day work week, Saturday may be used as a make-up day at straight time to fulfill the 40-hour work week due to inclement weather. On a 4-day work week, Friday may be used as a make-up day at straight time to fulfill the 40-hour work week. Make-up days shall be scheduled for a minimum of 8 hours, except in the case of inclement weather in which Section 12.5 shall apply. This minimum shall also apply when more than one shift or multiple shifts are worked.

D. The changing of the regular starting time, except in the case of overtime and the switch from a 5- day and 4-day work weeks shall be a 4-week minimum.

SECTION 12.2 OVERTIME

Overtime pay for hours outside of the standard work week and work day, defined in Section 12.1, and all work on Saturdays shall be paid at time and one half the hourly rate and benefits will be paid on straight time. All work on Sundays shall be paid at two times the hourly rate and benefits will be paid at straight time.

SECTION 12.3 SHIFTS

A. Flexible Schedules - Scheduling of shift work, including Saturday and Sunday work, shall be within the discretion of the Contractor in order to meet Project Work schedules and existing Project Work conditions. Shifts must have prior approval of the Construction Manager or Clerk of Works and Owner and must be scheduled with not less than three work days' notice to the Local Union.

B. Second and/or Third Shifts - Saturday and/or Sunday Work.

The second shift shall start between 3 p.m. and 6 p.m. and the third shift shall start between 11 p.m. and 2 a.m. Shift differentials shall be straight time plus fifty percent (50%) of the applicable Schedule A agreement shift differential. No other premium or payments for such work shall be required unless such work is in excess of 40 hours during the week. There shall be no reduction in hours worked on a second and/or third shift, except that when 3 shifts are working together, the length of one or more shifts can be reduced to accommodate a 24-hour day and only actual hours worked will be paid. Work performed on Saturdays or Sundays shall be paid as provided in the applicable Schedule A Agreement.

C. To clarify above, Schedule A Shift Differential designated percentage rates vary according to each trade's prevailing Collective Bargaining Agreement. Shift work as part of this Project Labor Agreement is 50% of the designated percentage of the

shift percentages of each trade, for example if a trade's shift differential is 15% it would be 7.5%.

SECTION 12.4 HOLIDAYS

A. Schedule - There shall be seven (7) recognized holidays:

- New Year's Day,
- President's Day,
- Memorial Day
- Fourth of July
- Labor Day
- Thanksgiving Day
- Christmas Day

All said holidays shall be observed on the dates designated by New York State Law. In the absence of such designation, they shall be observed on the calendar date, except that holidays which occur on Sunday shall be observed on the following Monday and holidays which occur on a Saturday shall be observed on the previous Friday.

B. Payment-Regular holiday pay, if any, on a recognized holiday shall be in accordance with the applicable Schedule A agreement. There will be no benefits paid on holidays unless worked.

C. Exclusivity - No holidays other than those listed in Section 12.4 shall be recognized or observed in relation to holiday pay and benefits.

SECTION 12.5 REPORTING PAY

A. When on a five-day work week, employees who report to the work location pursuant to a regular schedule and who are not provided with work for whatever reason, shall receive two (2) hours reporting pay, four (4) hours if work starts and eight (8) hours pay if work occurs after the 4th hour except in the case of inclement weather in which hours worked after the four hours shall be paid and when on a four-day work week with a 10-hour day, (3), (4), (5) and (10) shall apply as per the same terms above.

B. When an employee who has completed his or her scheduled shift and has left the Project site is "called out" to perform special work of a casual, incidental, or irregular nature, the employee shall receive pay for actual hours worked at applicable straight time or overtime rates in accordance with this Agreement, but no less than a minimum guarantee of two (2) hours at the employee's straight time rate.

C. When an employee leaves the job or work location of their own volition, is discharged for cause, or is not working as a result of the Contractor's invocation of Section 12.8 below, he or she shall be paid only for the actual time worked.

D. There shall be no pay for time not actually worked except as specifically set forth in this Article 12 and where an applicable Schedule A agreement applies to Forepersons, Stewards and Lead Engineer in reference to pay.

SECTION 12.6 PAYMENT OF WAGES

A. Payday: Payment shall be made by check, drawn on a New York bank with branches located within commuting distance of the job site or by direct deposit. Paychecks shall be issued by the Contractor at the job site by 3:00 p.m. on Thursdays. In the event that the following Friday is a bank holiday, paychecks shall be issued on Wednesday of that week. Not more than one week's wages shall be held back in any pay period. Paycheck stubs shall contain the name and business address of the Contractor, together with an itemization of deductions from gross wages.

B. Termination: Employees who are laid off or discharged for cause shall be paid in full for that which is due them at the time of termination. The Contractor shall also provide the employee with a written statement setting forth the date of layoff or discharge.

SECTION 12. 7 INJURY/DISABILITY

An employee who, after commencing Project Work, suffers a work-related injury or disability while performing Project Work duties, shall receive no less than eight (8) hours wages for that day. Further, the employee shall be rehired at such time as the employee is able to return to duties provided there is still Project Work available for which the employee is qualified and able to perform.

SECTION 12.8 EMERGENCY WORK SUSPENSION

A Contractor may, if considered necessary for the protection of life, property, and/or safety of employees or others, suspend all or a portion of Project Work. In such instances, employees shall be paid for actual time worked; provided however, that when a Contractor requests that employees remain at the job site available for Project Work, employees shall be paid for "stand- by" time at their hourly rate of pay.

XIII. ARTICLE 13 - APPRENTICESHIP & HELMETS TO HARDHATS

SECTION 13.1 APPRENTICE RATIOS

Recognizing the need to maintain continuing supportive programs designed to develop adequate numbers of competent workers in the construction industry and to provide craft entry opportunities for minorities, women, and economically-disadvantaged non-minority males, Contractors will employ apprentices in their respective crafts to perform such Project Work as is within their capabilities and that is customarily performed by the craft in which they are indentured. Contractors may utilize apprentices and such other appropriate classifications as are contained in the applicable Schedule A agreement in a ratio of not less than twenty-five percent (25%) of the work force by craft (without regard to whether a lesser ratio is set forth in the applicable Schedule A agreement), unless the applicable Schedule A agreement provides for a higher percentage. The first person assigned to the job shall be a Journeyman. The second person assigned may be an apprentice. Subsequent assignments shall be Journeymen until the applicable ratio is achieved. This assignment shall be repeated until staffing needs are satisfied. Apprentices and such other classifications as are appropriate will be employed in a manner consistent with the provisions of the applicable Schedule A agreement.

SECTION 13.2 NYS DEPARTMENT OF LABOR- APPRENTICESHIP

To assist the Contractors in attaining a maximum effort on this Project, the Unions agree to work in close cooperation with, and accept monitoring by, the New York State Department of Labor to ensure that minorities and women are afforded every opportunity to participate in apprenticeship programs that result in the placement of apprentices on this Project.

SECTION 13.3 NEW YORK HELMETS TO HARDHATS

The Contractors and the Unions desire to facilitate the entry into the building and construction trades of veterans who are interested in careers in the building and construction industry. The Contractors and the Unions agree to utilize the services of the Center for Military Recruitment, Assessment and Veterans Employment (the "Center") and the Center's "New York Helmets to Hardhats" program as a resource for preliminary orientation and assessment of construction aptitude; referral to apprenticeship programs or hiring halls; counseling and mentoring; and support networks, employment opportunities, and other needs as identified by the parties.

The Unions and the Contractors agree to work with the Center to create and maintain an integrated database of veterans interested in working on the Project as well as information about apprenticeship and employment opportunities related to this Project. To the extent permitted by law, the Unions will give credit to such veterans for bona fide, provable past experience.

SECTION 13.4 PARTICIPATION GOALS (MBE, WBE, SDVOB, LABOR SURPLUS AREA)

A. SUCF, Contractors, the Hudson Valley Building and Construction Trades Council and its affiliated Unions are committed to meeting New York State Participation Goals, if any are applicable to the Project, and shall be in alignment with the current goals or standards set for by New York State requirements for Minority Business Enterprises (MBE), and Woman Owned Business Enterprise (WBE). The Local Union shall actively participate in community outreach and recruitment programs established to achieve goals of eighteen percent (18%) Minority Business and Twelve percent (12%) Women's Business participation and six percent (6%) Service-Disabled Veteran Owned Business participation.

B. Outreach by the General Contractor, if applicable, Contractors, Hudson Valley Building and Construction Trades and affiliated Unions and contractor associations to ensure participation goals of NYS Certified MBE, WBE and SDVOB firms and Labor Surplus Area recruitment are met will be required through the project.

C. Where the above requirements of Section 13.4 do not apply, reference in this section shall not apply.

XIV. ARTICLE 14 - NO DISCRIMINATION

SECTION 14.1 COOPERATIVE EFFORTS

The Contractors and Unions agree that they shall not discriminate against any employee or applicant for employment because of race, color, religion, sex, national origin, marital status, age, Union or non-Union status, real or perceived sexual orientation or any other status protected by law, in any manner prohibited by law or regulation. It is recognized that special procedures may be established by Contractors and Local Unions and the New York State Department of Labor for the training and employment of persons who have not previously qualified to be employed on construction projects of the type covered by this Agreement. The parties to this Agreement shall assist in such programs and agree to use their best efforts to ensure that the goals for female and minority employment are met on this Project. Nothing in this section shall be grieveable.

SECTION 14.2 LANGUAGE OF AGREEMENT

The use of the masculine or feminine gender in this Agreement shall be construed as including all genders.

ARTICLE 15 - GENERAL TERMS SECTION 15.1 PROJECT RULES

SECTION 15.1 PROJECT RULES

A. SUCF, the General Contractor and Contractors may establish from time to time such reasonable Project rules as are necessary for the good order of the Project. These rules shall be outlined at the pre-job conference with the Council, detailed in the contract documents, approved by the President of the Council, posted at the Project site, and may be amended thereafter as necessary.

B. Security Protocols - If applicable, with Owner's approval and in their sole discretion, will determine security protocols for the entire Project Site. Strict compliance by all Contractors and subcontractors of all tiers and their respective personnel with security procedures, protocols, and directives issued by these entities or its delegated, is required at all times.

SECTION 15.2 TOOLS OF THE TRADE

The welding/cutting torch and chain fall are tools of the trade having jurisdiction over the Project Work performed. Employees using these tools shall perform any of the Project Work of the trade. There shall be no restrictions on the emergency use of any tools or equipment by any qualified employee or on the use of any tools or equipment for the performance of Project Work within the employee's jurisdiction.

SECTION 15.3 SUPERVISION

Employees or other personnel shall work under the supervision of the craft foreperson or general foreperson for the applicable hiring or subcontracting Contractor

SECTION 15.4 FULL WORKDAY

A. Employees shall be at their Project Work area at the starting time established by the Contractor.

Employees or other personnel shall work under the supervision of the craft foreperson or general foreperson for the applicable hiring or subcontracting Contractor

ARTICLE 16 - SAFETY PROTECTION OF PERSON AND PROPERTY

SECTION 16.1 SAFETY REQUIREMENTS

Each Contractor will ensure that applicable OSHA and New York State mandated safety requirements are at all times maintained on the Project and the employees and Unions agree to cooperate fully with these efforts. Employees must perform their Project Work at all times in a safe manner and protect themselves and the property of the Contractor from injury or harm. Failure to do so may be grounds for discipline, including discharge. Prevention of accidents at the site is the responsibility of the Contractors, its employees, subcontractors and suppliers, persons, and entities at the Project Site. The Contractors shall establish their own safety programs implementing safety measures, policies, and standards conforming to those required or recommended by governmental and quasi-governmental authorities having jurisdiction.

SECTION 16.2 CONTRACTOR RULES

Employees covered by this Agreement shall at all times be bound by the reasonable safety, security, and visitor rules as established by the Owner. Such rules will be referenced in the Contract Documents and may be distributed to Contractors for further distribution to personnel and/or posted in conspicuous places throughout the Project.

SECTION 16.3 INSPECTIONS

The Contractors, Owner, Architect/Engineer retain the right to inspect incoming shipments of equipment, apparatus, machinery, and construction materials of every kind.

ARTICLE 17 - TEMPORARY SERVICES

Temporary light, power, cooling, ventilation and other services shall only be required on the specific request of a Contractor and when requested shall be assigned in accordance with the Contract Documents. Temporary coverage may be provided by the supplying Contractor's employees already working under this Agreement during regular work hours. The supplying Contractor will determine the need for temporary coverage requirements during non-work hours. For safety reasons, temporary light and power panels will only be accessed by employees of the Contractor responsible for supplying the temporary light and power panels. Coverage requirements shall not require a standby employee who is not performing Project Work. There shall be no stacking of trades on temporary services. In the event temporary services are claimed by multiple trades, the matter shall be resolved pursuant to Article 10.

ARTICLE 18 - SAVINGS AND SEPARABILITY

SECTION 18.1 THIS AGREEMENT

In the event that the application of any provision of this Agreement is enjoined, on either an interlocutory or permanent basis, or is otherwise determined to be in violation of law, the provision involved (and/or its application to a particular part of the Project, as necessary) shall be rendered, temporarily or permanently, null and void, but the remainder of the Agreement shall remain in full force and effect to the extent allowed by law. In the event a court of competent jurisdiction finds any portion of the Agreement to be invalid, the parties will immediately enter into negotiations concerning the substance affected by such decision for the purpose of achieving conformity with the court determination and the intent of the parties hereto for contracts to be let in the future.

SECTION 18.2 NON-WAIVER

Nothing in this Agreement is intended to be or shall be construed as a waiver by any Union(s) of any prevailing wage determination or schedule that is applicable to their trade for any public work that has been or may be performed in the future on any work outside the scope of this Agreement. Nothing contained in this Agreement is intended to be or shall be construed as a waiver by any Union(s) of any more favorable term or condition of employment that may be contained in any collective bargaining agreement applicable to work outside the scope of this Agreement.

ARTICLE 19 - FUTURE CHANGES IN SCHEDULE A AREA CONTRACTS

SECTION 19.1 CHANGES TO AREA CONTRACTS

Each Schedule A agreement incorporated by reference into this Agreement by Schedule A shall continue in full force and effect until the Contractor and/or Union parties to the area collective bargaining agreements which are the basis for the applicable Schedule A agreement, notify the Owner and General Contractor in writing of the agreed upon changes in the Schedule A agreement which is applicable to the Project, and their effective dates. Such changes shall only be effective to the extent consistent with this Agreement. Any disagreement between signatories to this Agreement over the incorporation into Schedule A of provisions agreed upon in the renegotiation of area collective bargaining agreements shall be resolved in accordance with the procedure set forth in Article 9 of this Agreement.

SECTION 19.2 LABOR DISPUTES DURING AREA CONTRACT NEGOTIATIONS

The Unions agree that there shall be no strikes, work stoppages, sympathy actions, picketing, slowdowns or other disruptive activity or other violations of Article 7 affecting the

Project by any Local Union involved in the renegotiation of area local collective bargaining agreements, nor shall there be any lock-out on this Project affecting a Local Union during the course of such renegotiations.

ARTICLE 20 - PROJECT SPECIFIC

SECTION 20.1 CLEANING

It is the responsibility of prime contractor & respective trades on a daily basis, to clean debris generated by the work process in their immediate work area. Such shall be removed to a collection site at the edge of their immediate work area for removal. The Prime Contractor discretion will ensure laborers are provided in a sufficient quantity to remove such debris or waste materials. A clean work site results in a safe and more productive job site. All cleanup during construction shall be performed by the trade having jurisdiction for cleanup. The Contractor will ensure a clean and safe workplace. The General Contractor may back charge Contractors accordingly if clean up becomes unsatisfactory.

SECTION 20.2 PROJECT EXCLUDED WORK

For clarification purposes the following work performed on the project shall be excluded and not covered under this agreement:

A. Audio visual equipment, wiring and programming is excluded work. AV pathways and power shall be covered work.

B. Security system equipment (CCTV, card access control, cameras, intrusion detection, etc.) devices/equipment, testing and programming is excluded work. Conduit and wiring shall be covered work.

C. IT Equipment including servers, network switches, and UPS is excluded work. All conduit, wiring, devices (jacks, outlets, racks, patch panels) terminations, and testing shall be covered work.

D. Fire alarm programming is excluded work. Fire alarm conduit, wiring, and device installation shall be covered work. (Sole sourced to existing vendor)

E. Complete building management systems (BMS) installation, programming and testing. Conduit, pathways and wiring up to boxes and panels shall be covered work.

F. Artwork and Branding is excluded work except when shown on contract documents (Plans specifications) it shall be covered work.

G. Branding and food service signage if procured and installed by the campus under separate contract.

H. The following campus furnished and installed kitchen equipment: Ice machines, water filtration systems, water dispensers, coffee and espresso brewers, soda and refreshment dispensers, char-broilers, fryers, griddles or other free standing kitchen equipment.

I. Installation of furniture, fixtures, and equipment (FF&E) purchased directly by the Campus or a Campus-affiliated entity and not included in Section 20.3 below.

SECTION 20.3 PROJECT INCLUDED WORK – KITCHEN

For clarification purposes the below work performed on the project shall be included and covered under this agreement:

A. Contractor furnished and contractor installed equipment such as but not limited to (except excluded elsewhere in agreement) sinks and sink surroundings, fume hoods and associated control panels, fire suppression systems, walk-in coolers/freezers, vents and fans, floor drains, troughs & grates, corner guards, work counters & wall shelving when built in or connected to walls, floors or ceilings.

B. Owner furnished and contractor installed such as but limited to range & hearth oven, combi-oven & associated water filtration system, tilting kettles with filler systems, food shields with heat and lights, drop soup wells, drop tray wells, dump station with heat lamp, heated deck, cold pans, beverage & desert counter, ceiling mounted utensil rack, accumulator & accessories.

SECTION 20.4 GEOTHERMAL

The Unions agree that all work associated with vertical drilling of geothermal wells for SUCF project 081056 Renovate Peregrine Hall Project shall be performed by craft employees of suitable skill. The determination of suitability shall be made solely by the subcontractor or contractor performing vertical drilling of geothermal wells. If for any reason the Unions subject to the agreement are unable to provide a craft employee within the timeframe provided in the agreement who meets the requirements provided for in the project specifications, the Unions agree that the contractor will instead be able to hire any employee of its choosing, including a worker who is not a member of a union. All other work associated with the installation of geothermal wells, including grouting, piping, site work, excavation, backfilling, shall be covered by the Agreement.

The Unions agree to act in good faith in influencing contractors to bid on the work associated with the installation of geothermal wells. The General Contractor will make best efforts to utilize geothermal contractors who are signatory to collective bargaining agreements with trade Locals having such jurisdiction when economically feasible.

ARTICLE 21 – HUDSON VALLEY BUILDING AND CONSTRUCTION TRADES LABOR MANAGEMENT ALLIANCE

If not prohibited by law and there are no direct or additional costs to the Owner parties to this Agreement agree to participate in the Hudson Valley Building and Construction Trades Labor Management Alliance.

Schedule A

COLLECTIVE BARGAINING AGREEMENT can be viewed by visiting the Hudson Valley Building and Construction Trades Council website:

BuildItUnion.org	Username:	hudsonvalley
	Password:	buildingtrades

IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTORS TO VERIFY SCHEDULE A AGREEMENTS WITH THE RESPECTIVE UNIONS SIGNATORY TO THE PROJECT LABOR AGREEMENT.

For questions about this agreement or Schedule A contact:

Todd Diorio: (845) 565-2737 or email: tdiorio555@aol.com
President, HVBCTC

PROJECT LABOR AGREEMENT – LETTER OF ASSENT

The undersigned party confirms that it agrees to be a party to and to be bound by the Project Labor Agreement (the "PLA" or the "Agreement") as such Agreement may, from time to time, be amended by the parties or interpreted pursuant to its terms. The terms of the Project Labor Agreement, its Schedules, Addenda and Exhibits are herby incorporated by reference herein.

The undersigned, as a Contractor or Subcontractor (hereinafter Contractor) on the project know as:

SUCF RENOVATE PEREGRINE DINING HALL PROJECT _____
Initial

(hereinafter PROJECT), for and in consideration of the award to it of a contract to perform work on said PROJECT, and in further consideration of the mutual promises made in the Project Labor Agreement, a copy of which was received and is acknowledged, herby:

1. Accepts and agrees to be bound by the terms and conditions of the Agreement, together with any and all schedule; amendments and supplements now existing or which are later made thereto:

2. Agrees to be bound by the legally established collective bargaining agreements and local trust agreements as set forth in the Project Labor Agreement and this Letter of Assent but only to the extent of the work covered by the PLA

3. Certifies that it has no commitments or agreements that would preclude its full and complete compliance with the terms and conditions of said Agreements. The Contractor agrees to employ labor that can work in harmony with all other labor on the Project and shall require labor harmony from every lower tier subcontractor it has engaged or may engage to work on the Project. Labor harmony disputes/issues shall be subject the Labor Management Committee provisions.

4. Agrees to secure from any Contractor(s) (as defined in said Agreement) which is or to become a Subcontractor (of any tier), to it, a duly executed Letter of Assent identical to this document.

5. Understands as per the PLA that they shall not be required to sign local Collective Bargaining Agreements.

_____
Name of Contractor

_____
Authorized Officer & Title

_____
Address

_____
Phone/ Fax/ Email

_____
Workman's Comp Carrier & Policy #

_____
General Liability Carrier & Policy #

_____ _____
Signature Date

Sworn to before me this _____day of _____, 2025

_____
Notary Public

Schedule B

The National Plan for the settlement of jurisdictional disputes in the construction industry ("National Plan") can be viewed by visiting the Hudson Valley Building and Construction Trades Council website:

BuildItUnion.org	Username:	hudsonvalley
	Password:	buildingtrades

For questions contact:

L. Todd Diorio: (845) 565-2737
President, HVBCTC

Schedule C – Trade Assignments

The General Contractor and Council will develop a trade assignment form to be used on the Project.

IN WITNESS WHEREOF the parties have caused this Agreement to be executed and effective as of the ____day of March 2025.

FOR THE HUDSON VALLEY BUILDING AND CONSTRUCTION TRADES COUNCIL:

By: _____

L. Todd Diorio, President

~~SUCF~~ Construction Manager:

By: _____

Eric Robert, President

GENERAL CONTRACTOR:

By: _____

Company Name: _____

International Union of Bricklayers & Allied Craftworkers Local No. 1

Signed: Michael Clifford **Title:** Field Rep

Email: mclifford@bac1ny.com **Phone:** 845 522 4561

International Brotherhood of Boilermakers, Iron Ship Builders, Forgers & Helpers District No. 5

Signed: Signed by: Raphael Escobar E86FCDE2EBC141C... **Title:** Business Manager

Email: boilermakerslocal5@verizon.net **Phone:** 5,164,972,405.00

Bricklayers and Allied Crafts, Tile, Marble & Terrazzo Union of New York & New Jersey Local No. 7

Signed: Signed by: Patrick Bonici 0FB68055722549D... **Title:** Business Agent

Email: Pbonici@baclocal7.com **Phone:** 917-734-9546

United Union of Roofers, Waterproofers and Allied Workers Local No. 8

Signed: Signed by: Nick Sicilians 7B6002EDD7FC490... **Title:** Business Manager

Email: nick@roofers8.org **Phone:** 718-361-0145

District Council No. 9 International Union of Painters and Allied Trades A.F.L.-C.I.O.

Signed: _____ **Title:** _____

Email: _____ **Phone:** _____

International Union of Bricklayers & Allied Craftworkers Local No. 1

Signed: _____ **Title:** _____

Email: _____ **Phone:** _____

International Brotherhood of Boilermakers, Iron Ship Builders, Forgers & Helpers District No. 5

Signed: _____ **Title:** _____

Email: _____ **Phone:** _____

Bricklayers and Allied Crafts, Tile, Marble & Terrazzo Union of New York & New Jersey Local No. 7

Signed: _____ **Title:** _____

Email: _____ **Phone:** _____

United Union of Roofers, Waterproofers and Allied Workers Local No. 8

Signed: _____ **Title:** _____

Email: _____ **Phone:** _____

District Council No. 9 International Union of Painters and Allied Trades A.F.L.-C.I.O.

Signed: _____ **Title:** BM|ST DC9

Email: CSavarese@dc9.net **Phone:** 212 255-2950

Docusign Envelope ID: EEE28554-414E-8A06-838D-75E5E0E5DB94
Docusign Envelope ID: 00519762-5569-8F64-807E-E5AE81C147C5

Laborers' International Union of North America Local No. 17

Signed: Dean M. Lombardi **Title:** Business Manager.

Email: Dean@LiuNA17.com **Phone:** 845-565-2737

International Association of Sheet Metal, Rail and Transportation Workers (SMART) Local No. 38

Signed: Signed by: Michael Colombo 064DAAEF2151480... **Title:** President/Business Manager

Email: unionoffice@smart38.org **Phone:** 845-278-6868

International Association of Heat & Frost Insulators & Allied Workers Local No. 40

Signed: Signed by: Mark Stuto 86FBFFEC6BF5484... **Title:** Manager

Email: awl40@insulators.org **Phone:** 5,184,694,071.00

International Union of Elevators (IUEC) Local No. 138

Signed: Signed by: 8B3109DA768D4FA... **Title:** Business Rep

Email: IUEC138@outlook.com **Phone:** 8455908281

O.P.C.M.I.A Plasters Union Local No. 262

Signed: Signed by: F4CB8B1596C0417... **Title:** Business Manager

Email: dalleyne@noedc.org **Phone:** 914)255-8601

North Atlantic Sates Regional Council of Carpenters Local No. 279

Signed: _____ **Title:** Business Manager

Email: SSmith@nasrcc.org **Phone:** 845-263-7516

International Brotherhood of Electrical Workers Local No. 363

Signed: _____ **Title:** Business Manager

Email: SFraHo@IBEWLU363.org **Phone:** 845-216-7023

International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers Local No. 417

Signed: _____ **Title:** BUSINESS MANAGER

Email: matts417@Verizon.net **Phone:** 845 629-1185

International Brotherhood of Teamsters Local Union No. 445

Signed: Signed by: Dan Maldonado 18B63E170B9246F... **Title:** Principal officer

Email: dmaldonado@teamstersunion445.org **Phone:** 8455494850

Road Sprinkler Fitters Local No. 669

Signed: Signed by: Shaun Bauer-On Behalf of Business Manager B40E4A14976A454... **Title:** _____

Email: shaunbauer.669@gmail.com **Phone:** 845-685-6437

New York City District Council of Carpenters Local No. 740 / 2287 / 1556

Signed: Signed by: Adam Harkin 4CB4CAC9082741A... **Title:** Vice President

Email: aharkin@nycdistrictcouncil.org **Phone:** 6464670135

United Cement Masons Local No. 780

Signed: Signed by: 73CD91E9692B453... **Title:** Business Manager/ F.S.T.

Email: Michael@noedc.org **Phone:** 2,128,146,159.00

International Union of Operating Engineers Local No. 825

Signed: Michael Ham **Title:** BUSINESS REP

Email: MHAM@IUOE825.ORG **Phone:** 845.741.8458

U.A. of Plumbers and Steamfitters Local No. 21

Signed: Signed by: Sean Carey 755D036C8A3A4B0... **Title:** Business Manager

Email: Seanc@local21union.com **Phone:** 914-629-0782

SECTION 01 00 00 - GENERAL REQUIREMENTS

010000 General Requirements Reference Documents bound after 017900

1. Construction Fire Safety Weekly Review form
2. Statement of Special Inspections forms
3. Submittal Log
4. Campus specific general requirements, if any

01 11 00 Description of Work (Section A)

1. Work to be Done
    a. The Work to be done under the Contract, in accordance with the Contract Documents, consists of performing, installing, furnishing and supplying all materials, equipment, labor and incidentals necessary or convenient for the construction of SUCF Project No. **081056-00.**
    b. **Project 081056-00** titled **Renovate Peregrine Dining Hall, Bldg. No. 032**
    c. and carrying out all of the duties and obligations imposed upon the Contractor by the Contract Documents.
    d. The main features of the Work shall include, but not be limited to the following:
2. Work Not Included:
    a. Work not included in the Work of the Contract are those items marked "N.I.C"; movable furnishings, except those specifically specified or indicated on the Drawings; and items marked "by others".

01 11 13 Coordination with Other Contracts

1. 081092-00 Upgrade Water and Sewer Infrastructure

There may be other contracts let for work to be done in and/or adjacent to Work areas of this Contract during the Work period of this Contract. This Contractor and such other contractors shall coordinate their work to conform to the progressive operation of all the work covered by such contracts and afford each other reasonable opportunities for the introduction and storage of their supplies, materials, equipment, and the execution of their work. Refer to Section 2.16 of the Agreement.

2. Where Work is turned over from/to others, perform the following:
    a. At least two weeks prior to the turnover date, inspect the work provided by others with the Consultant. In accordance with Section 2.12(2) of the Agreement, notify the Consultant of apparent discrepancies or defects in such other construction that would render it unsuitable for the proper execution and results required by this Contract.

3. At least two weeks prior to the turnover date, inspect the Work of this Contract to be turned over to others with the Consultant and perform corrective work, if any, as determined by the Consultant, prior to the scheduled turnover date.

4. If there are other contracts let for work to be done in and/or adjacent to Work areas, those contracts will have requirements for policies of insurance that are similar to Article V of the Contractor's Agreement, but with coverage and limits commensurate with the work of those other contracts, as determined by the Campus and/or letting agency. If requested by the Contractor, a copy of the

contract documents will be made available for review within 15 calendar days after the receipt of the request.

01 18 13 Utility Shutdowns and Cutovers

1. Except as otherwise expressly provided in the Contract Documents, the Contractor shall be responsible for submitting to the Consultant and the Fund, for their approval, a proposed schedule of all utility shutdowns and cutovers of all types which will be required to complete the Project; said schedule should contain a minimum of eight (8) weeks' advance notice prior to the time of the proposed shutdown and cutover. Most campuses of the State University of New York are in full operation 12 months of the year, and shutdowns and cutovers, depending upon their type, generally must be scheduled on weekends, at night, or during holiday periods. The Contract consideration is deemed to include all necessary overtime and all premium time, if any, that is required by the Contractor to complete the shutdowns or cutovers.

2. In the event the Contractor shall disrupt any existing services, the Contractor shall immediately make temporary connection to place such service back into operation and maintain the temporary connection until the Contractor makes the permanent connection. All Work must be acceptable to the Consultant and the Fund.

01 21 43 Time Allowances

1. Time Delay Allowance: In addition to the requirements of Article III of the Agreement, the base bid Contract duration to perform the Work specified in the proposal shall include not less than five (5) consecutive and/or non-consecutive eight hour working days in the Time Progress Schedule for Delays that are of no fault of the Contractor or any of its subcontractors or suppliers or caused by events or conditions that could not be reasonably anticipated. Provide notice of Delay per Section 3.04 and request use of this time allowance. When approved by Consultant, the time allowance is expended for each workday that the contractor is unable to work and all Delay time used is tracked in the Time Progress Schedule. After this base bid time allowance for Delay is expended, comply with the requirements of Article III for any additional Delays.

01 23 00 Alternates (Section B)

1. General
   a. The extent and details of the Alternates are indicated on the Drawings and described in the Project Manual.
   b. Where reference is made in the description of the Alternate to products, materials, or workmanship, the specification requirements applicable to products, materials or workmanship in the Total Bid shall govern the products, materials, and workmanship of the Alternate as if these specification requirements were included in full in the description of the Alternates.

2. Alternates

01 26 13 Requests for Information

1. In the event that the Contractor determines that some portion of the Drawings and Project Manual for the project requires clarification or interpretation by the Consultant per Sections 2.01

and/or 2.08 of the Agreement, the Contractor shall submit a Request for Information (RFI) in writing to the Consultant. The Contractor shall create an RFI log in a format approved by the Consultant. Submit the RFI log to the consultant prior to each periodic Field Meeting. Update the RFI log to reflect comments received at the Field Meetings. The Contractor shall define the issue that requires clarification or interpretation in clear and concise language as follows:

a. The Contractor shall customize RFI forms and logs for this project and submit them to the Consultant for review and approval prior to submission of any RFIs.
b. Forms should include provisions for the Consultant's response, Contractor acceptance of response or rephrasing of question, and the Consultant's additional response if requested.
c. Forms should include provisions for locating the issue within the building, by room number, name and nearest columns.
d. RFIs shall confirm that reasonable locations for the information required have been reviewed and document those locations by specific references to the Drawings and Project Manual on the RFI.
e. The Contractor shall review the RFI for systemic or global implications, including review of other pending RFIs and work of other phases, so that the final RFI submitted represents a reasonable consolidation of similar requests.
f. The Contractor shall coordinate and review the RFIs originating from its trades, subcontractors, suppliers, manufacturers, etc. for compliance with this process, including polling them and meeting with them onsite to review the issue prior to its submission as an RFI. The Consultant may attend such meetings.
g. Contractor to coordinate response from Consultant with subcontractors.
h. The RFI shall contain a description of what the Contractor believes to be the intent of the design documents, with due regard to Section 1.06 of the Agreement, along with reasons why the RFI is required.
i. RFIs shall only be submitted on the approved forms.
j. RFIs that do not comply with the above requirements will be returned to the Contractor for revision and resubmission.

2. The Consultant will review all RFIs to determine whether they are RFIs within the meaning of this term as defined above. If the Consultant determines that the document submitted is not an RFI, it will be returned to the Contractor un-reviewed as to content, for resubmission in the proper manner and it will be removed from the RFI log.
3. The Consultant will respond to all RFIs within 10 business days of its receipt, unless the Consultant determines that a longer time is required for an adequate, coordinated response. If the longer response time is deemed necessary, the Consultant will notify the Contractor of that necessity and indicate when the response will be completed within 10 business days of its original receipt.
4. Based on projects of similar complexity, it is anticipated that there may be up to 400 RFIs on this project and that multiple responses may be required to adequately answer each RFI.
5. Responses to RFIs shall not change any requirements of the documents.

01 26 43 Amendments (Section E)

1. Amend the Agreement as follows:

In Article I, Section 1.12, Notices, after the "The State University Construction Fund" in the line starting with Name, insert "Brian Parlman – Senior Project Coordinator"; in the line starting with Title, insert "SUNY New Paltz – Renovate Peregrine Dining Hall, Bldg. No. 032"; in the line starting with Address, insert "H. Carl McCall SUNY Building, 353 Broadway, Albany New York 12246"; and in the line starting with Telephone Number, insert "518-320-3236" and in the line starting with E-mail address, insert "brian.parlman@suny.edu".

2. Amend the Agreement as follows:

In addition to the superintendent required by 2.06(1) and (2), provide a full-time Project Manager who has ten (10) years' experience as a Project Manager with experience on three (3) other projects of similar size and scope. "Full-time" in the previous sentence is defined as being on the site of the Work at any time Work is being performed unless an absence is approved by the Consultant and the Fund. The Project Manager shall provide constant personal attention in managing the prosecution of all the Work while it is in progress and shall respond to concerns expressed by the Consultant and the Fund in a responsible and reliable manner. The Project Manager shall not be obligated to perform any other Work that is likely to impair his/her attention to the prosecution and completion of the Work of this Contract. The Project Manager shall be acceptable to the Consultant and the Fund and shall not be replaced without written permission of the Consultant and the Fund unless the Project Manager proves to be unsatisfactory to the Contractor or ceases to be in its employ. The value of the Project Manager in the Contract Breakdown required in Section 4.08 of Article IV shall be fixed at $10,000 for each month, or portion thereof, prior to the Substantial Completion date specified on page A-1 of the Agreement.

3. Amend the AGREEMENT as follows:

In Article II, Section 2.20, paragraph 1(b), 12th line, after the word "Section" ADD the following:

"except for the single / sole source shown in Specification Sections

(14 21 00 – ELECTRIC TRACTION ELEVATOR)

(27 51 17 - INTERTELECOMMUNICATION AND MASS NOTIFICATION)

(28 31 00 – ADDRESSABLE FIRE ALARM SYSTEM: HONEYWELL – NOTIFIER INSPIRE)

where the use of another product is not permitted."

4. Amend the Agreement as follows

a. In Article VI, Section 6.03, Part (2) Contract Goals, DELETE paragraph (a) in its entirety and replace with the following:

"a. For purposes of this **Contract**, the Fund hereby establishes goals of _18% for Minority-Owned Business Enterprises ("MBE") participation and _12% for Women-Owned Business Enterprises ("WBE") participation **(collectively, "MWBE Contract Goals")**.

i. The _18% goal for Minority-Owned Business Enterprise participation shall be applied as follows: a maximum of one third (1/3) of the goal may be applied to purchases of materials, supplies, and equipment from MBEs.

ii. The _12% goal for Women-Owned Business Enterprise participation shall be applied as follows: a maximum of one third (1/3) of the goal may be applied to purchases of materials, supplies, and equipment from WBEs."

5. Amend the Agreement as follows:

In Article IX, Use of Service-Disabled Veteran-Owned Business Enterprises in Contract Performance, paragraph (5), change "«SDVOB_goal»%" to "_6%"

6. Amend the Agreement as follows:

Section 5.07 Builder's Risk

(1) The Contractor shall procure and maintain, at its own cost and expense, until final acceptance of all work covered by this Contract or until the Project has been turned over for use by the State University of New York, whichever event occurs earlier, a builder's risk insurance policy covering all risks, with fire, extended coverage, vandalism and malicious mischief coverage. In the event the loss occurs at an occupied facility, the policy shall permit occupancy without the consent of the insurance company. The policy shall cover the cost of removing debris, including demolition as may be legally necessary by operation of any law, ordinance, or regulation, and property of the State held in their care, custody and/or control.

(2) The policy shall be in an amount equal to the Project's insurable value, i.e., the Contract consideration less the cost of the Contractor's Performance and Labor and Material Bonds; the cost of trees, shrubbery, lawn grass, plants and the maintenance of the same; the cost of demolition; the cost of excavation; the cost of foundations, piers or other supports which are below the undersurface of the lowest basement floor, or where there is no basement, which are below the surface of the ground, concrete and masonry work; the cost of underground flues, pipes or wiring; the cost of earthmoving, grading and the cost of paving, roads, walks, parking lots or athletic fields; and the cost of bridges, tunnels, dams, piers, wharves, docks, retaining walls and radio and/or television towers and antennas.

(3) The policy may contain a provision for a $500 deductible for each loss to a Project having an insurable value of less than $1,500,000 and a $1,000 deductible for each loss to a Project having an insurable value of $1,500,000 or more.

(4) The Fund, the Contractor and its subcontractors, as their interests may appear, shall be named as the parties insured under said policy.

(5) The Contractor shall have the sole responsibility to promptly report any loss to the insurer and/or its representatives and to furnish the latter with all necessary details relating to the occurrence of the loss and the amount thereof. The Fund, the Contractor and all subcontractors of the Contractor waive all rights, each against the others, for damages caused by fire or other perils covered by insurance provided under the terms of this Section, except such rights as they may have to the proceeds of insurance received; provided, however, this waiver shall not apply to any manufacturer, supplier or similar agent under any guarantee or warranty.

(6) The Contractor shall not violate or permit to be violated any condition of such policy and shall at all times satisfy the fire safety requirements of the Fund and the insurance company issuing the same.

(7) The procurement and maintenance of said policy shall in no way be construed or be deemed to relieve the Contractor from any of the obligations and risks imposed upon it by this Contract or to be a limitation on the nature or extent of such obligations and risks.

(8) Not less than thirty days prior to the expiration date or renewal date, the Contractor shall supply the Fund with an updated replacement certificate of insurance and endorsements. The Contractor shall advise the Fund of any letter or notification that cancels, materially changes, or non- renews the policy and Contractor shall require the insurance carrier(s) to copy the Fund on any letter or

notification that cancels, materially changes, or non- renews the policy. Before the Contractor shall be entitled to have any progress payment rendered on account of the work which is to be insured pursuant to this Section, it shall furnish to the Fund a certificate in duplicate of the insurance herein required. Such insurance must be procured from an insurance carrier approved by the Fund, licensed to do business in the State of New York ("admitted" carrier), and rated at least "A-" by A.M. Best Company.

01 29 00 10 Payment to Campus for Utilities

1. For metered utilities used during the Work and shown in the Contract Documents, the Contractor shall reimburse the Campus for actual costs of Campus provided or Campus purchased metered utilities. Contractor's utility usage shall be determined from metering.

a. Existing meters are shown in the Contract Documents and, if Campus owned, shall be calibrated by the Campus in the presence of the Contractor within 30 days after receipt of the Notice to Proceed or prior to first usage, whichever is longer. Existing metered utilities whose usage shall be reimbursed are:

b. New temporary/permanent metering is shown in the Contract Documents. Temporary meters shall be approved by the Consultant and installed within 30 days after receipt of the Notice to Proceed or prior to first usage, whichever is longer. Temporary meters shall record data in the same units as the Campus is billed. Temporary meters shall not be removed prior to Substantial Completion unless permanent project meters are being utilized.

c. The Contractor is responsible for reimbursement of metered utilities from 30 days after receipt of the Notice to Proceed until Substantial Completion. At a minimum, the Campus may bill the Contractor for metered utility usage monthly. The Campus shall be paid by the Contractor within 30 days of receipt of a bill.

d. Reimbursement amounts shall be calculated using metered data and the Campus' actual cost for the metered utility during the metered period. Unless a different period is agreed to by the Campus, read the meters monthly in the presence of Campus and/or Site Representative. Except where the Campus is the utility provider, actual cost for the metered utility will be determined using actual billing received from the applicable utility vendor. The Campus is the utility provider and has the following reimbursable rates for:

i) <Consultant inserts which utilities are provided by the Campus, such as HTHW, Steam, etc. and their reimbursable rates. Rates must be approved by the Fund prior to bidding. If NA, delete 2.d.i and last sentence in 2.d.>

e. Upon request, provide documentation of actual cost paid to Campus with pencil copy of progress payment applications.

2. If the Contractor fails to meter utility consumption as specified above then it agrees that it shall reimburse the Campus at the rate of $.0061 per day times the gross square foot project Work area of XXX gross square feet less the actual cost paid to the Campus for metered costs, if any. <Consultant calculates and inserts XXX. Example: in Consultant's cost estimate, existing building is 98,000 GSF and addition is 2,000 GSF. Therefore, project Work area is 100,000 GSF. Cost per day is $610.>

01 31 00 Project Management Procedures

1. The SUCF booklet titled "*Management of Design & Construction Manual*" contains forms, schedules sample documents, communications protocols, procedural requirements for meetings, submittals, reporting, testing, inspection, demonstration, acceptance, payments, changes, turnover, closeout and other administrative requirements. With specific direction from the Fund, the Contractor shall comply with the applicable construction phase requirements in the "*Management of Design & Construction Manual*" during the Work of the Contract. Current versions of the forms are available at the SUCF website:

https://sucf.suny.edu/sites/default/files/docs/ManagementOfDesignConstructionManual_1-2023.pdf

01 31 00 10 Single Contract Responsibility

1. The Agreement with the Contractor is for a single Contract to provide all Work shown and specified. Any reference to separate electrical, communications, mechanical, plumbing, etc. contracts, unless clearly designated with another contract number or as "NIC", shall refer to the Contractor. Any reference to "Consultant", "Engineer", "Landscape Consultant", etc. shall be deemed to refer to the Consultant defined in Article 1.01 of the Agreement."

01 31 00 20 Sheet-metal Fittings and Ductwork

1. The Contractor's base bid shall include all sheet metal fittings necessary for the routing of the duct systems shown on the Contract drawings for the Project. The straight duct sections shown on the Contract drawings may not provide the required routing to achieve the connections due to coordination with other trades (and existing conditions). The amount of these additional fittings may be up to 35% of the total ductwork shown (by weight) on the project Contract drawings. Fittings include elbows, transitions, offsets, taps, tees, branches, and all non-straight ductwork of all types and configurations; plus related insulations, linings, supports and appurtenances. Additional fittings required by field conditions encountered after the approval of the Coordinated Drawings shall be the sole responsibility of the Contractor and shall be installed at no additional cost to the Fund.

01 31 10 Language Requirement

1. All spoken and written communications, submittals, signage, and other media regarding the Project shall be in the English language unless otherwise agreed to by the Fund. If any original documents required for the Project are in any other language, provide an English translation, which shall take precedence in the event of conflict with the original language. When technically feasible, use gender neutral terminology in lieu of gendered.

01 31 13 10 Exploratory Demolition

1. Perform exploratory demolition to discover subsurface and other physical conditions that differ substantially from those shown on or described or indicated on the Contract Drawings. Exploratory demolition shall begin upon receipt of the Notice to Proceed and occur in locations selected in coordination with the Consultant. Exploratory demolition includes removal of portions of the building and site construction, improvements, systems, fixtures and finishes. Perform demolition in a controlled manner so as to not affect Asbestos Containing Materials, Presumed Asbestos Containing Materials, Mechanical, Electrical, Plumbing and other building systems in ceilings, wall cavities, pipe chases and other concealed spaces. Where required to expose existing conditions, perform selective abatement of asbestos and other Work in Divisions 2 through 28 of the technical specifications. Provide access to the Consultant to visually inspect

conditions uncovered. As required by Section 2.12 of the Agreement, notify the Consultant of physical conditions discovered during exploratory demolition. Provide temporary barriers and coverings over the uncovered areas. Provide control measures to properly limit the spread of dust, debris, and other materials. Legally dispose of debris generated during the selective exploratory demolition.

2. Exploratory demolition shall be paid for as a Field Order in accordance with Section 4.05A of the Agreement, except for the following work, which is part of the base bid:

01 31 19 Field Meetings

1. Periodic job meetings will be scheduled by the Consultant during the course of construction. The Contractor, and, upon request of the Consultant or the Fund, its principal subcontractors and manufacturer's representatives, shall attend such meetings and be prepared to furnish answers to questions on progress, workmanship, requests for Information, supplementary information, scope and price for extra work, if any, or any other subject on which the Consultant or the Fund might reasonably require information.

2. In addition to the requirements of Section 3.06 of the Agreement, the Contractor shall submit bi-weekly reports to the Consultant summarizing the last two weeks of Work and next two weeks of Work anticipated, listing the percent of Work complete by trade, tabulating manpower utilized / projected, relevant shop drawing and submittals progress, relevant offsite fabrication progress and providing other information which may be reasonably required to understand the progress of the work.

3. In addition to the above referenced meetings, the Contractor shall schedule and manage periodic coordination meetings at the site between it and all its trades, subcontractors, suppliers, manufacturers, etc. to settle the allotment of Work per Article I, Section 1.07 of the Agreement and to review progress on submittals and shop drawing, progress on installation of the work, conflicts between work of trades, compliance with the design intent, adherence to the Contractor’s schedule, quality control, planning for commissioning and training of Campus personnel, and other items which require coordination and sharing of information. Representatives of the Consultant and the Fund may attend these meetings to observe and make comments. These meetings shall be held a minimum of once per month and more frequently where required to effectively coordinate the construction. The Contractor shall prepare and distribute summary minutes of these meetings within 5 working days of the meeting, in accordance with the “Document Tracking and Change Control Paragraph” of this section. Distribution of the coordination meeting minutes shall be to all attendees with copies to the Fund and Consultant whether they are in attendance or not.

4. The personnel representing the Contractor and its principal subcontractors shall have the authority to make decisions directly affecting the work.

5. In addition to the above meetings, meet to review fire safety periodically during the Work and, starting approximately sixteen weeks prior to the scheduled date of substantial completion, the Contractor’s principals, project manager and those of its significant subcontractors shall attend additional weekly meetings with the Owner and its consultant(s) to review the progress on preparing close out deliverables, including those in Sections 01 78 23, Operating Instructions and Manuals, 01 78 36, Warranties and 01 79 00, Training of Campus Personnel.

01 31 19 10 Mock ups

1. Progress on the completion of mock ups specified in Divisions 2 through 48 shall be addressed by the Contractor at periodic meetings.

2. Provide a list of mock ups with their dates for installation to begin, installation completion, Consultant review period (which may be up to 15 working days), punch list corrections, and mock up acceptance.

3. For compliance with Section 3.03 of the Agreement, a mock up shall be considered a Sample. Accepted mock ups shall be clearly segregated and marked and remain undisturbed and accessible during the work.

    a. Accepted mock ups are the Sample and the criteria against which the remaining Work shall be judged.
    b. Spaces with interior mockups shall have the scheduled lighting fixtures installed, or the equivalent temporary lighting, as approved by the Consultant, during the review and approval period.
    c. Remove markings when directed by the Consultant.
    d. Promptly record mock up locations on the Record Drawings.
    e. Where the markings have been removed and not record exists as to which surface was the mock up, the Consultant may either select a different surface as the mock up or direct the Contractor to install another one, at no additional cost to the owner.
    f. Unless an accepted mock up is specified to remain in Divisions 2 through 48, demolish and remove mockups when directed by the Consultant.

4. Installation methods, environmental conditions and other contractor employed means and methods for installing the mock up may be observed by the Consultant and shall be employed and maintained in all remaining work. Workers performing the mock up Work shall be employed for installation the remaining work. At any time during the remaining work, if additional workers are employed, they may be requested to demonstrate competency by providing a mock up of their work.
5. In addition to the mock ups that are specified in Divisions 1 through 48, inclusive and for the purposes of determining if workers are suitable and competent in accordance with Section 2.07 of the Agreement, the Consultant may direct the Contractor to have workers provide mock ups to demonstrate their ability to properly perform their Work prior to performing Work that will be part of the completed Project.

01 31 19 33 Pre-Installations Meetings

1. Attend meetings to coordinate the efforts of all concerned parties with construction activities and to demonstrate that adequate preparations for particular construction activities have been completed. These meetings are required for any mobilization, demolition work, excavation, removal of any demolished or excavated material from the site, LEED related work, concrete work, steel erection, waterproofing, roofing, utility shutdowns or taps, commissioning or Campus training related Work and where required within each specific section of the specifications. The meeting should be attended by the following:

    a. Consultant
    b. Construction Fund
    c. Campus
    d. Contractor’s Superintendent
    e. Subcontractor’s Superintendent / Foreman, as applicable.

f. Material and/or Equipment Manufacturer's Representatives, as applicable.

2. Agenda: Review and discuss applicable requirements of the Work for the following:
   a. Compliance with Contract Documents and related field or change orders
   b. Submittals, products, and mock-ups
   c. Manufacturer's recommendations
   d. Warranty requirements
   e. Employment of competent and suitable workers and equipment
   f. Deliveries, storage, and handling
   g. Possible conflicts and compatibility problems
   h. Schedule
   i. Weather limitations
   j. Compatibility of materials
   k. Acceptance of substrates
   l. Quality Assurance
   m. Testing and inspecting requirements (including Special Inspections)
   n. Temporary facilities and controls
   o. Space and access limitations
   p. Regulations of authorities having jurisdiction
   q. Required performance results
   r. Protection of completed construction
   s. Other factors that may reasonably apply to the work

01 31 26 Document Tracking and Change Control

1. The Contractor shall maintain a computerized document and change control system to prepare, monitor status, and electronically file and send all documents and changes associated with, and required for the Project. If this system is different than the system required in Section 01 33 23, Shop Drawings and Samples, customize and configure this system as required to provide optimal coordination with the system required in Section 01 33 23.

2. The Contractor must have a MAPI-compliant e-mail system, such as Microsoft Outlook or Exchange.

3. The Contractor must provide experienced and trained personnel to maintain the document control system per this requirement. If the Consultant or the Fund determines that experienced personnel are not operating the control system, then the Contractor's personnel must attend the minimum training at Contractor's sole expense.

01 32 13 Special Project Schedule/Phasing

1. The Contractor shall be permitted to start field-Work subject to the following.

   a. In accordance with Section 2.06 of the Agreement, provide onsite the approved dedicated superintendent who has documented experience on three (3) other projects of similar size and scope where he/she effectively lead and managed crews of the size required to perform the similar work, planned and implemented a similar sequence of Work that minimized the impact to Campus/building occupants and deployed and managed the workers required to meet the schedule and the specified level of quality for the completed similar work.

   b. Demonstrate that all materials required for the complete performance of the proposed field work are on site, inspected, inventoried and deemed readily available for installation of the work.

c. Provide a sequenced, summary list of field activities related to the transfer of the Work areas from the Campus to the contractor and related mobilization activities. Include those related to posting and notification to Campus, erection of temporary signage for code, directional and informational purposes, and other activities required to facilitate the start up of construction activities. Review the list with the Campus and the consultant and modify it to incorporate their comments. Follow the sequence of the approved list during field activities.

d. Submit the Safety Procedures Manual required in Paragraph 01 35 23, "Safety and Protective Facilities," below.

2. In order to assist the Contractor in the planning and scheduling of construction activities, the Contract Documents have diagrams and narratives depicting a preferred sequence for closing off portions of the buildings and Campus and for performing and completing portions of the work. The preferred sequence provides for continuity of Campus operations and describes certain Work necessary for continuity of Campus operations. Provide all sequencing and minor phasing that may not be specifically indicated on the phasing documents but is reasonably inferable from the way the Campus operates. The Contractor may propose alternative construction phasing, provided such phasing satisfies the requirement of continuous Campus operation.

a. The Contractor shall schedule the Work for expeditious completion in accordance with Section 3.01(2) of the Agreement. The proposed schedule must be established in cooperation with the Campus and account for Campus calendar restrictions listed in this section that affect the Contractor's access to the Work areas and construction activities. At each periodic meeting, the Time Progress Schedule required by Section 3.02 of the Agreement shall be reviewed for compliance with phasing requirements. Revise and update the Time Progress Schedule to properly depict the Work required to maintain continuity of Campus operations.

i. First phases of Work shall include appropriate time in the schedule for: (1) understanding Campus operations, training crews, acclimating trades and Campus to sequence and apportionment of activities; (2) additional meetings (up to twice a week during the first twelve weeks after the Notice to Proceed) with the Owner, consultant and the Contractor's principals, project manager and those of its significant subcontractors; (3) re-sequencing activities to recover from start up delays in the progressive operation of interrelated work and (4) other activities commonly associated with the start up of field work.

b. Academic Calendar: The Contractor is advised that the Campus intends to maintain a full institutional program throughout the Project duration. The Campus will make continuous use of adjacent spaces, buildings and site, except where Work is scheduled or specified to occur. All Contract Work must be scheduled and performed without causing unscheduled interruption of the normal institutional activities and processes. The Contractor shall coordinate their work with the following Campus Calendar, and No Utility shutdowns will be permitted during Registration, Study Periods, Exam Periods, or Commencement.

i. Insert web link to Campus academic calendar here. SUNY New Paltz Academic Calendar

c. The Work Site will be available to begin construction on **01/20/2027**. Unless otherwise indicated, normal working hours on the Campus are between 7:00 AM and 4:00 PM. Sequence the Work in phases to meet the following interim milestones dates:

i. Describe interim milestones and dates, as applicable

d. On the Date of Substantial Completion in the Proposal, access to the Work area for any uncompleted Work and for punch list items shall be restricted to after 5:00 PM and prior to 7:00 AM, or other times that are convenient for the Campus, and comply with the following:

3. Methods of performing Work shall not hinder or disrupt the Campus' occupancy, reduce Campus provided levels of cleanliness and ambient environmental conditions and affect building systems, services, and utilities serving the building unless, upon completion of each shift's work that is performed outside of normal Campus work hours, the Contractor provides cleaning to return the Work areas to a similar level of cleanliness as normally provided by the Campus, returns spaces to their normal ambient environmental conditions and restores building systems, services, and utilities serving the occupancy.

4. No material or equipment shall remain inside the building unless in the active use and control of Contractor personnel.

5. The Contractor shall provide all utility relocations and re-routings necessary to maintain the existing utilities at their level of service being used by the occupants, including limiting their shutdowns for tie-ins and cutovers to those periods specified. All new Work shall be in place, tested and accepted prior to performing a shutdown for the required tie in.

01 32 13 10 Scheduling of Work - Contractor's Coordination with locality

1. Contractor's Coordination with locality: Construction traffic off Campus shall be coordinated with the local Department of Public Works and Public Safety Department (insert telephone number). The construction entrance and restrictions shown have been negotiated between the locality and the Owner. The Contractor shall submit a plan showing which off Campus streets will be used to access the Work areas shown for all Work of this contract. The plan for each route used shall indicate types of vehicles, loading, anticipated vehicular noises, calendar days and hours of use, and other reasonable information that may be requested by the Consultant. The Contractor shall provide all necessary notification and training to personnel operating vehicles associated with this project to assure that the routes are followed in compliance with the restrictions. Sequence traffic of this Contract to coordinate with and not reduce the current usage of off Campus streets.

2. Monthly meetings, in addition to those scheduled below in the paragraph 01 31 19 "Field Meetings", shall be held with the Contractor, locality, Fund, Campus and Consultant at the locality's offices. Topics for discussion may include the connections to the locality owned infrastructure, local events, contractor's traffic and delivery plan through off Campus streets and idling of construction vehicles.

01 32 13 20 Scheduling of Work - Contractor's Coordination with the with utility companies

1. The Contractor shall coordinate and cooperate with utility companies, including scheduling the work of other trades to sequence with the work schedule required by the utility companies.
2. The Contractor shall pay all costs associated with the work of the utility companies for extension and connection to their services on both a temporary and permanent basis. For gas services, standard fees and special fees for the specified pressure are required.
3. The Contractor shall accept the form of contract proposed by the utility companies without exception.
4. The Contractor shall provide any riders, amendments, etc. to its own insurance policies that it deems proper to cover the work of utility companies in accordance with Article V of the agreement or to cover other liabilities that may arise from the contractor's relationship with the utility companies on this project.

5. The Contractor shall provide prompt payments to utility companies as required to advance their work, but accept payment for such work from the Fund in accordance with Article IV of the Agreement.
6. This project includes work to be performed by the following utility companies:

NAME	Contact	Telephone number
(insert utility names here)		

01 32 16 Project Schedule

Project Schedule shall include the following:

a. After receipt of the Notice of Award but before receipt of the Notice to Proceed, the Contractor, unless otherwise directed by the Fund, shall update the working plan and schedule previously submitted in accordance with the Information for Bidders to define the contractor's planned operations during the first 120 days and submit it to the Fund and the Consultant for their acceptance. The updated working plan and schedule shall be in the form of suitable charts, diagrams or bar graphs and shall be based on the Contractor's logic and time estimates. When updated, such plan and schedule shall be sufficiently detailed to show clearly, in sequence, all salient features of the work of each trade including: the anticipated time of commencement and completion of such work and the interrelationship between such work, submission of Shop Drawings and Samples for approval, approval of Shop Drawings and Samples, placing of orders of materials, fabrication and delivery of materials, installation and testing of materials, contiguous or related work under other contracts, and other items pertinent to the work. The Notice to Proceed may be withheld until this schedule is received and is deemed responsive to the project requirements.

b. After receipt of the Notice to Proceed but before processing second progress payment application, the Contractor, unless otherwise directed by the Fund, shall submit to the Fund and the Consultant for their acceptance its proposed working plan and project time schedule for all the Work covered by the Contract, and shall include activities for preparation and submission of all Shop Drawings and Samples and show all Contractor provided tests that are specified in Divisions 1 through 48, inclusive**.** Said proposed working plan and schedule shall be prepared in accordance with the form and requirements set forth in the preceding paragraph. In addition to the requirements in 4.10 (1) of the Agreement, the second progress payment application will not be acted on until this schedule is received and is deemed responsive to the project requirements. Submit four (4) printed copies, one PDF and the electronic file in its native format.

c. The aforesaid proposed working plan and schedule shall be revised by the Contractor until they are satisfactory to the Fund and the Consultant, and the same shall be periodically updated **bi-weekly** thereafter. Whether or not the Consultant and the Fund have accepted the Project Schedule, submit the Project Schedule to the Fund and the Consultant for acceptance at such time or times as the Fund or the Consultant may request.

d. The proposed working plan and schedule, including any revision or revisions thereof, when accepted by both the Fund and the Consultant will become the Schedule of Record (SOR). The SOR, as the same may be revised as stated above by the Contractor and accepted by the Fund and the Consultant, shall be strictly adhered to by the Contractor.

e. Phases of Work shall include time in the schedule for training crews, acclimating trades to the sequence and apportionment of activities, additional meetings with the owner, consultant, Contractor and the significant subcontractors, and re-sequencing activities to recover from start up delays typically caused by normal activities associated with the start up of field work.

2. Milestone Dates & Summary Activities

Project Schedule shall include the following:

a. The Contractor shall prepare a construction progress schedule which shall consist of a Critical Path Method (CPM) schedule as described below and shall incorporate the Schedule Summary Activities and Milestone Dates as indicated in item j below.

b. The development and updating of the Construction Progress Schedule shall be by the critical path method (CPM) and shall be computer generated using the latest version of PRIMAVERA Systems scheduling software. Other computer software will not be accepted.

c. The CPM Schedule shall consist of time-scaled logic diagrams and other data specified herein. The diagrams shall show activities of the project in detail and in summary format. Diagrams shall also show the order and interdependence of activities and the sequence in which the Work is to be accomplished, incorporating the schedule summary activities and milestone dates indicated in item j below, and as further planned by the contractor. All logical relationships shall be finish to start, with the following exceptions: (1) Activities at the start of the project may be start to start (2) At a milestone or project finish, activities may be finish to finish. Lag factor use will be limited, and if used, identified as a functional activity. The use of imposed start dates will also be limited. The retained logic mode shall be used for calculations.

d. In addition to construction activities the CPM schedule shall include, but not be limited to, the following:

i. Testing activities / required inspections (Show Contractor provided tests that are specified in Divisions 1 through 48, inclusive, and Consultant performed tests, where applicable).
ii. Subcontractor selection and approvals (major subcontractors submitted within 48 hours of bid).
iii. Shop drawing preparation and approval activities. Sequence submissions to provide sufficient time for the coordination of shop drawings of one trade that impact other trades, as required by Section 2.19 of the Agreement. Also include mock ups and pre-installation meetings where specified. Where practical, submittals shall be broken into smaller review packages of approximately 50 to 75 drawings. Each package will have its own activities in the schedule for submission, review and procurement. Package and schedule submission of shop drawings in sequence with the procurement schedule to spread submittal review periods out over the greatest time period practical.
iv. Procurement schedule (order dates, fabrication, deliveries, and long lead items – specifically list any significant product whose source is outside of the United States).
v. Special Campus restrictions, i.e., Campus approvals for Work site access, shutdowns and other impacts (noise/ testing & examination/ site and building access etc.).
vi. Requirements for any on site shutdowns that may impact work.

vii. Status of LEED credits
viii. Training and/or instruction of Campus personnel.
ix. Commissioning of major building systems including pre-functional testing, startup, functional testing, operational scenario testing and retesting as required.
x. Campus furnished products installed by the Contractor.
xi. Periodic meetings on construction fire safety with the Campus Fire Prevention Program Superintendent and other interested parties.
xii. Meetings on site with Consultant to review mock ups and detailing. Include time for the Consultant to review and consider the work of mock ups, which may be up to two weeks before mockups can be approved and installation of the material or systems may begin.

e. The detail of information shall be such that activity duration, in general, will range from 3 to 30 days. Activity description and duration shall be shown for each activity on the diagrams. The critical path shall be determined and shall be clearly indicated on the diagrams.

f. A Summary Schedule of the entire Work of the Contract shall be provided along with the initial submittal and each update using PRIMAVERA software. The contractor shall code the activities on the initial detailed schedule to summarize the same so that the resulting Summary Schedule Activities match those listed in item j below.

g. A CPM Report shall be provided along with the initial submittal and each update and shall include a tabulation of each activity shown on the CPM schedule. The following information shall be furnished as a minimum for each activity: Activity I.D., Description, Duration, Early/Late Start, Early/Late Finish, and Total Float. Reports and updating will indicate actual start and completion for completed activities and actual start and percentage complete and remaining duration for activities in progress.

h. Initial phases of Work shall include time in the schedule for training crews, acclimating trades to the sequence and apportionment of activities, additional meetings with the owner, Consultant, Contractor and the significant subcontractors, and re-sequencing activities to recover from start-up delays typically caused by normal activities associated with the start up of field work.

i. Submission and review of the schedule shall be as follows:

i. A preliminary CPM schedule, consisting of time-scaled logic diagrams and other data specified herein, defining the contractor's planned operations during the first 120 days, shall be submitted after receipt of the Notice of Award but before receipt of the Notice to Proceed. The CPM schedule shall be sufficiently detailed to show clearly, in sequence, all salient features of the work of each trade including: the anticipated time of commencement and completion of such work and the interrelationship between such work, submission of Shop Drawings and Samples for approval, approval of Shop Drawings and Samples, placing of orders of materials, fabrication and delivery of materials, installation and testing of materials, contiguous or related work under other contracts, and other items pertinent to the Work that may occur in the first 120 days. The Notice to Proceed may be withheld until this schedule is received and is deemed responsive to the project requirements.

ii. The complete CPM Schedule, including the time-scaled logic diagrams, narrative, summary schedule, manpower schedule if applicable and activity reports shall be submitted within 60 calendar days after receipt of the Notice to Proceed but before

processing second progress payment application. The Fund's Consultant will review The Schedule to ascertain that it meets the overall project objectives and that it contains all necessary milestone dates or other required elements. At that time the schedule will become the Schedule of Record (SOR) and the established "Base-Line" for project monitoring purposes. In addition to the requirements in 4.10 (1) of the Agreement, the second progress payment application will not be acted on until this schedule is received and is deemed responsive to the project requirements.

iii. This review of the Schedule of Record is for the sole purpose of determining whether it meets the overall project objectives and milestone dates and to whether all related phasing, restrictions, Campus supplied fixturing/equipment, or any other potential impact(s), have been addressed. Agreement on the "SOR" does not constitute approval of the Contractor's means, methods, sequencing, or duration of activities. THIS IS THE SOLE RESPONSIBILITY OF THE CONTRACTOR.

iv. Float is defined as the amount of time between the early start date and the late start date or the early finish date and the late finish of any of the activities in the CPM Schedule. Float is not time for the exclusive use or benefit of either the Fund or the Contractor.

v. Initial submittal, complete revisions and updates shall be submitted in four (4) copies (minimum 18" X 24"), one PDF and in native electronic format with all input data formatted for PRIMAVERA software.

vi. The Schedule of Record shall be revised by the Contractor until it is satisfactory to the Fund and the Consultant, and the same shall be periodically revised thereafter and submitted by the Contractor to the Fund and the Consultant for acceptance at such time or times the Fund or the Consultant may request.

vii. Whether or not the Consultant and the Fund have accepted the Project Schedule, the Schedule of Record shall be updated bi-weekly and shall be submitted along with the Contractor's application for payment. For the two intervening month periods the Contractor may "mark for progress" the SOR and submit with the applications for payment.

viii. If the actual progress of the Work is behind the timeline of the Schedule of Record by more than 15 working days, then the Contractor shall provide a new and completely revised schedule that shall be called the recovery schedule. The recovery schedule shall be provided as follows: 1.) if more than 120 calendar days remains until the date of Substantial Completion then provide within 30 calendar days after the Consultant's request, 2.) if less than 120 calendar days remains until the date of Substantial Completion, provide within 15 calendar days after the Consultant's request. The recovery schedule's purpose is to change the sequencing of activities, duration of activities, and /or other factors as required to return the actual projected schedule completion date to that of the SOR. The recovery schedule is in addition to the regular updates. If the actual progress of the Work is behind the timeline of the submitted recovery schedule by more than 15 working days, then the Contractor shall provide a new and completely revised recovery schedule.

ix. Provide a historic schedule as requested by the Fund that shows the actual activity descriptions and durations that occurred during the work for each activity on the diagrams. The actual critical path shall be documented and shall be clearly indicated on the historic diagrams.

j. Milestone Start and Finish Dates & Summary Activities

i. Notice to Proceed (Milestone Date)
ii. Mobilization
iii. Environmental & Abatement
iv. Site Preparation & Foundations
v. Building Frame & Enclosure
vi. M-E-P-S (Mechanical, Electrical, Plumbing, Sprinkler & Fire Systems) Rough-In & Major Equipment Installation
vii. M-E-P-S Systems-Fixtures/Trim/Accessories
viii. Interior General Construction
ix. Equipment & Specialties
x. Exterior Walks, Parking, Roads, & Landscape
xi. Testing, Training & Commissioning
xii. Life Safety Systems Tested & Accepted (Milestone Date)
xiii. Substantial Completion/ C of O (Milestone Date)
xiv. Campus Installed/Furnished FF&E (Fixtures, Furnishing & Equipment)
xv. Start of Guarantee Period
xvi. SUCF Contract Completion Date (if different from above)
xvii. Final Completion - All punch list/outstanding items satisfied (Milestone Date)
xviii. Field Order Work (multiple periods of work proportional to the dollar value of the field order allowance starting at the Notice to Proceed and ending at Substantial Completion.)
xix. Other milestones as may be required by the Fund, the Consultant or the Contractors.

01 32 29 Notice of Non-Compliance

1. In the event the Consultant views the Work or some portion thereof and finds that it has not been performed in accordance with the requirements of the Contract documents, a Notice of Non-Compliance will be issued to the Contractor for action. Payment shall not be made for any portion of the Work for which a Non-Compliance Notice has been issued and the Work not corrected to the satisfaction of the Consultant.

2. Upon receipt of a Non-Compliance Notice the Contractor shall provide a written response to the Notice within ten (10) working days after receipt of the Notice. The Contractor's response shall detail either:

a. Why they believe that the Work was performed in accordance with the Contract documents, or,
b. What corrective action they intend to take, at their sole expense, to correct the non-conforming work.

3. Refer to Article II Section 2.02 for Contractor's contention to the decision.

01 32 33 Project Photographs

1. Prior to beginning work, the contractor shall schedule with the Consultant, the Campus, and the Fund sufficient periods of time in which the Contractor shall photographically record existing conditions for all project areas using digital video in MPEG-2 format. Video shall be made at high resolution (1440 x 1152) and shall adequately zoom in on selected elements for clear representation of existing conditions. All video recording shall be done in the presence of the Consultant. Submit the completed video on DVD disk(s) to the Consultant for the record.

2. Photograph any and all damaged or misaligned materials or surfaces which may in any way be misconstrued as having occurred during the implementation of this Contract. Inspect all existing conditions on all paths of travel on the site, adjacent right of ways, and within the building with the Consultant. With clear labeling and convenient indexing, provide written documentation for each video disk referencing both the disk and site locations of recorded images of any and all damage that could be misconstrued as being caused by the Contractor's Work and/or access. Repair all damage to existing conditions and along the paths of travel caused by Contractor's Operations.

01 32 33 10 Photo Documentation Services

Provide comprehensive photo documentation services of construction progress and certain as-built conditions

Firm providing the services shall be independent of the Contractor. An acceptable firm will have three (3) years' experience in operation providing photo documentation using advanced indexing/navigation systems for construction projects of similar type, size, duration and complexity as this Project.

a. Services include secure web based access, electronic indexing, navigation, storage and record DVDs for the documentation.

b. Using the architectural drawings, provide an indexing and navigation making such drawings interactive using a web based interface. Indexing and navigation must be organized by both time (date-stamped) and plan location where all photographs were taken.

c. Provide digital photography (minimum resolution of 1936 x 1296.) to capture actual conditions throughout construction at critical milestones. Use lens that are appropriate for the required intent and use the same lens for similar photographs for the duration of the work.

d. Provide continuous web based access to images through the use of any standard Internet connection. Allow for multiple-user access, simultaneously, on-line. Access shall be secure and accomplished through individual passwords. Provide redundant server back-up of the documentation required. Provide technical support related to using the system upon user request.

e. Upon completion of the Project, provide final copies of all documentation with the indexing and navigation system embedded (and active). Provide copies in an electronic media format, typically a DVD or external hard-drive. On-line access will not be terminated until acceptance of the final copies by the consultant.

2. Provide photographs at regular intervals, typically monthly, chosen to properly sequence the photographs with the construction progress. Take photographs of both the exterior and interior construction of the project with the intent of capturing images of structure, utilities, systems and construction details that would not be visible once other installed work prevents observation.

Exterior progress photographs will include all elevations and major site features. Interior progress photographs will track interior improvements by spatial area, beginning in each spatial area once substantial interior work commences (typically at stud-work commencement) and continuing until completion.

a. Provide photographs of concrete slabs prior to placing concrete. Provide overlapping images of all in-slab utilities, including utilities and rough-ins enclosed in consolidated slab-on-deck and suspended slabs in multi-story construction.

b. Provide photographs of Mechanical, Electrical, Plumbing (MEP) and all other systems before installation of insulation, sheet rock or dry wall installation. Provide overlapping images of all finished systems located in the walls and ceilings of the building(s).

c. Provide photographs of finished condition at substantial completion, or other milestone approved by the Consultant. Provide images of all walls, ceilings and floors in their post-inspection, completed condition.

d. Provide photographs of miscellaneous events (i.e., materials arriving on site) during the periodic progress documentation, but which do not fit into the planned photo path. Insert images into a separate section in the navigation structure to allow convenient access to this information.

01 32 33 30 Roof Inspection

1. When directed by the consultant, prior to work on the existing roofs and again after completion of all work on / near those roof levels, use a firm experienced in roof inspection to scan the roofs with the infrared camera. Spray paint the exact contours of any and all moisture laden areas, if any, on the roof surface. During the survey, use a nuclear moisture detector to verify the accuracy of the infrared camera and to check questionable anomalies. Use the nuclear meter to detect moisture, if any, that is located deep in the roofing system. Provide a computer-generated roof plan to scale showing all pertinent roof top equipment and the locations, square footages, and contours of all moisture laden areas, if any. If required, provide corrective repairs and replacement roof systems when directed by the Consultant.

01 33 23 Shop Drawings, Samples, Submittals and other information - (Refer to Section 2.19 of the Agreement)

1) In addition to the requirements of Section 2.19 of the Agreement and as specified in Divisions 1 through 48, inclusive, comply with the submittal requirements of this section. In addition, where the term “or equal” is specified in Divisions 1 through 48, inclusive, refer to and comply with the requirements of Section 2.20 of the Agreement. Shop Drawings required Divisions 1 through 48, inclusive, may include drawings, diagrams, schedules, product data and other information or materials specially prepared for the Work by the Contractor to illustrate some portion of the work. Product data required by Divisions 1 through 48, inclusive, are standard illustrations, schedules, performance charts, instructions, brochures diagrams and other information amended by the Contractor to illustrate materials or equipment for some portion of the work.

ELECTRONIC SUBMITTALS

The Contractor shall set up and maintain a web-based submittal service to log, transmit and track (in real time) all project related documents.

a. All project submittals, reviews and re-submittals shall uploaded in Portable Document Format (PDF) and, if approved by the Consultant, other electronic formats requested by the Contractor. Divide, package and submit all submittals in accordance with Section 01 32 16, Project Schedule.

b. The service will also post, track and store RFI's (Request for Information), Supplemental Information, safety procedures manual, emergency contact and action plans, coordination drawings, traffic plans, utility cutover plans, schedule documents, meeting minutes, look-aheads, daily activity reports, project photo documentation, material safety data sheets, waste manifests, diesel emissions, field surveys, utility bills payable to the Campus, Campus furnished products, testing activities and results, closeout, Operating Instructions and Manuals, planting maintenance, commissioning submittals, SWPPP documents and other non-product related submittals required in the technical specifications. The service will review the Contract Documents and provide the list of items to be tracked.

c. The PDF files shall be created at a minimum resolution of 200 dots per inch utilizing the original document size and full color. Increase the resolution of the scanned file or images being submitted as required to properly present the information. PDFs created by scanning are not acceptable unless all images of text are properly and completely transformed into the electronic characters representing the text.

d. The Contractor shall include the full cost of Submittals Website project (all contracts) subscription in their proposal. When approved by the Consultant, all other project related consultants, Campus staff, other contractors and vendors will utilize the Submittals Website at no additional charge (unlimited number of users). Web-based training and support shall be available, free of charge from the Submittals Website, for all project participants.

e. Acceptable Submittal Website shall document conformance with the following requirements:

    i. Independently hosted, web-based system for automated tracking, storage and distribution of Contract submittals and other Contract related documents. FTP sites, e-mail exchanges, and server-based systems hosted from inside a contractor's office will not be considered.
    ii. Utilize 256-bit SSL encryption and hosted at SAS70 Type II compliant data centers.
    iii. Minimum four (4) years' experience of use on comparable commercial construction projects.
    iv. Website requirements:
        1. Minimum of four years documented 99.5% website uptime.
        2. b) Minimum on-line storage required for the duration of this Contract (until final closeout).
        3. c) Redundant storage of all project information (all contracts) at a minimum of two geographically separate storage sites (not in the same building).

f. At completion of project, provide PDF/A copies of all submittals (except physical samples) stored and labeled on four (4) sets of archival optical discs, Universal Serial Bus (USB) flash drives or other electronic data storage devices approved by the Consultant, which include all documents and tracking logs in a navigable format.

2. Paper prints (hard copies) of reviewed submittals:

   a. Provide ____ (xxx) Record Paper Copies:
      i. Paper copies shall be printed in a size format equal to the original document.
      ii. Scaled Shop Drawings shall be printed to the scale noted on the drawings.
      iii. The resolution of the printed copy shall be equal to that of the PDF file that it is being printed from.

   b. Contractor Copies: The Contractor will be responsible for making copies, for the Contractor's own use and for use by its subcontractors and suppliers.

   a. The Contractor shall submit to the Consultant for its approval six (6) sets of prints of all shop drawings required by the specifications. Divide, package and submit all submittals in accordance with Section 01 32 16, Project Schedule.

   c. Those marked *"REJECTED"* are not in accordance with the Contract Documents and shall be resubmitted.
   d. *"REVISE AND RESUBMIT"* Contractor shall correct and resubmit.
   e. *"MAKE CORRECTIONS NOTED"*: The contractor shall comply with corrections and may proceed. Resubmittal is not required.
   f. *"APPROVED - NO EXCEPTIONS TAKEN"*: The contractor may proceed.

   g. All shop drawings and/or submittals used on the construction site must bear the impression of the Consultant's review stamp as well as the Contractor's review stamp, indicating the status of review and the date of review. Contractor Copies: The Contractor will be responsible for making copies, for the Contractor's own use and for use by its subcontractors and suppliers.

   h. All shop drawings shall reflect actual site conditions and accurate field dimensions. Dimensioned shop drawings shall be submitted for all fabricated items. Incomplete submittals will be rejected without review. Using electronic copies of the Contract Documents to prepare shop drawings, if permitted in the technical specifications, doesn't relieve the contractor of its responsibility for the accuracy of all information contained on the shop drawings. Verify and coordinate all information necessary to produce accurate and complete shop drawings.

      i. All shop drawings, submittals and samples shall include:
      ii. Date and revision dates.
      iii. Project title and number.
      iv. Names of:
      v. Contractor
      vi. Subcontractor
      vii. Supplier
      viii. Manufacturer

   i. Provide information regarding shop drawings, submittals and samples at the Periodic Meetings.

   j. The project specific submittal log is bound after the General Requirements. Note: The bound submittal log provides a general submittals (shop drawings, samples, mock-ups, O&M manuals, training, extra stock, maintenance during the guarantee period, warranties, test reports and other submittals) in the technical specifications and may not be all inclusive. In

case of conflict or omission, the requirements of the technical specifications take precedence over the bound log.

k. At completion of project, provide PDF/A copies of all submittals (except physical samples) stored and labeled on four (4) sets of archival optical discs, Universal Serial Bus (USB) flash drives or other electronic data storage devices approved by the Consultant that include all documents and tracking logs in a navigable format. PDFs created by scanning are not acceptable unless all images of text are properly and completely transformed into the electronic characters representing the text.

01 33 23 20 Coordination Drawings

1. Before construction Work commences and before submitting shop drawings for sleeves, piping, ductwork, etc., the Contractor shall require that the installers/ subcontractors for all trades submit Coordination Drawings.

2. The Contractor shall manage the process so that each trade/subcontractor provides all required information in a timely manner. Coordination Drawings may be completed on a phased basis so as not to delay the overall project schedule. The CPM Schedule specified elsewhere in this section shall be amended to include the submission of Coordination Drawings. The same shall demonstrate how the Contractor intends to integrate the submission of Coordination Drawings to suit the overall project schedule.

3. Coordination Drawings shall show the resolution of trade conflicts in congested areas prior to submission of shop drawings and actual installation. The Drawings shall coordinate the placement and location of ductwork, fittings, light fixtures, cable trays, fire alarm devices, sprinklers, air terminals, hangers, supports and other ceiling mounted items shown and specified with each other, and other building elements such as ceilings, structural work, case work, equipment, doors, manufacturer's recommended maintenance clearances, code required clearances and visibility sightlines (NEC, etc.), access doors and other Contract work.

4. In public and occupied areas without scheduled finish ceilings, appearance is a major coordination factor. Reposition proposed locations of Work after Coordination Drawing review by the Consultant. Provide adjustments to the exact size, location and offsets of ducts, pipes, and conduit to achieve reasonable appearance objectives. Provide these adjustments as part of the Contract or notify the Consultant immediately as to why the adjustment cannot be made.

5. The medium and format of the Coordination Drawings shall be as follows:

   a) The Contractor shall use either the Overlay Drafting System with pin bar registration to assure layer alignment, or CADD software to create the Coordination Drawings.

   b) Each MEP Division trade shall be assigned a layer to create the detailing work of each section or division of the Specifications requiring coordination. The Contractor shall insure that the layer assigned to one trade cannot be modified by another trade, and that the final product clearly differentiates which trade is responsible for the respective information shown. The latter may occur through the use of colors or other distinct graphic methods.

   c) The final product shall be in the form of reproducible transparencies drawn at a scale not less than 3/8 inch per foot for the entire building and each mezzanine. Mechanical and Electrical equipment rooms shall be drawn separately at a scale not less than 1/2 inch per foot and be submitted with the

drawings of the entire building. At conflicts between the trades, provide details, elevations and sections of similar or larger scale as may be required to provide a clear three dimensional resolution of the conflict.

d) The Coordination Drawings shall be prepared as follows:

i) The Contractor shall prepare the base floor plan(s) in the medium chosen.
ii) The HVAC trade installer shall prepare the first layer of the Coordination Drawings showing all ductwork, and all pertinent heating piping and equipment. This plan may be a copy of the required ductwork shop drawings.
iii) The Contractor shall provide electronic or transparent copies to all the other trades/subcontractors.
iv) The Plumbing, Fire Protection, Controls and other non-electrical trades shall show all their piping, equipment, valves, fittings and other specified appurtenances.
v) The Electrical, Fire Alarm, and other electrical trades shall show all systems and equipment, including transformers, panels, terminals, devices, detectors, lighting fixtures, cable trays, outlets, and conduits and raceways 1" or larger. Cable tray layout shall include appropriate clearances to motors, ballasts, and other sources of electromagnetic interference.
vi) The Contractor shall review the Drawings and indicate areas of architectural, equipment, structural and other conflicts and obstacles and coordinate locations of rated and exterior walls to assure their continuity and closure as specified. The Contractor determines that all Work can be installed without interference. In the case of unresolved interference, notify the Consultant. The Consultant will then suggest to the Contractor as to how to revise the Drawings to eliminate interference. The Contractor shall then have the trade(s) revise their respective Drawings to eliminate interference.
vii) Fabrication and installation of Work in a given bay or area shall not proceed until the Contractor has made all trades agree on the exact arrangements for each bay or area. If a given trade proceeds prior to resolving conflicts, then, if necessary, that trade shall change its work at no extra cost in order to permit the other trades to proceed with a coordinated installation. Coordination approval may be given by the Contractor for a bay or area only after site meetings involving all trades have occurred.
viii) In the event of conflict areas without ductwork, each respective trade in conflict shall prepare coordination drawings showing the suggested final arrangements for review.

e) Coordination Drawings are intended for use by the respective trades during construction and shall not be construed as replacing either the shop drawings specified in the technical specifications or the Record Drawings required in the Agreement.

f) Submit Coordination Drawings for review in the same manner as specified for shop drawings. The Consultant's review of Coordination Drawings shall not relieve the Contractor from their responsibilities for coordinating the Work with the work of all trades involved on the Project. The Consultant's review shall not authorize any extra cost, omission and/or deviation from the requirements of the Contract Documents. Any costs arising from errors and omissions in the Coordination Drawings shall be borne by the Contractor.

g) Provide three copies of the Final Coordination Drawing transparencies, and/or electronic files of CADD drawings on CD-ROM at the completion of the work. All copies shall become the property of the Fund.

01 33 29 - Sustainable Design Reporting

When submission of environmental product declarations (EPDs) is required by the technical specifications, in addition to the individual EPD submittals, submit a list summarizing the materials/products covered by

each EPD submittal and the estimated total quantities used/installed of such covered materials during the Work completed to date. As directed by the Consultant, the list shall be submitted/updated annually and at Substantial Completion. If the submitted EPDs do not show the kgCO2 per the quantity unit used/installed for a covered material, provide such information upon request of the Consultant. Using the list and other information, the Consultant will calculate the estimated total kgCO2 (kilograms of carbon dioxide) emission equivalent for each covered material/product used/installed.

01 35 10 Archeological or Historical Finds

1. In the event that any relics or items with archeological or historical value or other valuable materials are discovered on the site or in a building by the Contractor or any subcontractor, the Contractor shall immediately notify Owner and appropriate authorities in accordance with applicable Laws and await the decision of Owner before proceeding with any further Work that might harm or destroy such relics. Neither Contractor nor any subcontractor shall have any property rights to such relics.

01 35 13 Conducting Work

1. All Work is to be conducted in such a manner as to cause a minimum degree of interference with the Campus' operation and academic schedule. Prior to any excavation, demolition or other work that may impact Campus and/or building utilities, systems and infrastructure by causing alarm(s), failure(s) or interfering with the ability of utilities, systems and infrastructure to serve the Campus, provide a written emergency action plan that clearly describes the steps required to safely shut down utilities, systems and infrastructure that are within the Work area and those outside the Work area and within approximately 25 feet of the Work area limits, as approved by the Consultant. The plan shall comply with the Fire Code of New York State. The emergency action plan shall identify the shut off point(s) for each utility, system and infrastructure and secondary shut off point(s) if the primary points fail or inaccessible. To identify shut off points, trace each utility, system and infrastructure in the presence of the Campus representative from the Work area to the shut off points. The emergency action plan shall describe the shutdown procedure, identity tools required for shutdown, sequence of activities required for proper shutdown, the name of the person(s) or trade(s) deemed competent to perform each activity in the shutdown sequence and names and telephone numbers of the Campus staff required to provide access to shut off points, assist in the shut off or perform portions of the shutdown activities. Submit the emergency action plan for review and approval at least two weeks prior to field work in the Work area. Field work shall not begin until the emergency action plan is approved.

2. By the end of each workday, the Contractor shall submit daily manpower counts and a brief description/location of the day's activities. *PLEASE NOTE: FOREMAN MAY HAVE TO STAY PAST NORMAL QUITTING TIME TO PROPERLY COMPLETE THIS PAPERWORK.* Manpower shall be broken down by job classification (foreman, journeyman or apprentice), and also by number of minority and women workers, including information for all subcontractors, suppliers or other workers. The report shall also note all deliveries, equipment on site, whether inspections passed or failed, visitors and inspections.

3. Proper attire is required on-site. Full-length pants, shirts with sleeves and hard sole work boots are required. No shorts, tank tops or sneakers are allowed. Workers not properly dressed will be sent home.

4. Safe and direct ADA accessible entrance to and exiting from the existing buildings shall be maintained at all times during regular hours while construction is in progress. Means of egress for construction workers shall comply with the Fire Code of New York State. Prior to performing any removals or construction that impairs free egress from existing building exits to refuge areas remote from the buildings, complete the installation of all temporary fencing, barricades and walkways.

Install temporary egress, stairs, ramps and paths around Work areas that comply with the Protection of Pedestrians section of the Safeguards During Construction chapter the New York State Uniform Fire Prevention and Building Code.

5. Unless otherwise permitted by the Consultant and the Fund, the removal and/or demolition of given work items shall not occur until the Contractor has all the required replacement materials on-site.

6. Code of Conduct: The Contractor and its employees shall comply with College regulations governing conduct, background checks, access to the premises, and operation of equipment. In addition:
   a. All employees of the Contractor and every subcontractor must comply with all site access control and security procedures prescribed by the Campus which may include, but are not limited to, the wearing of identification badges, ingress and egress through controlled entry and exit points, and use of card readers or other electronic identity verification devices. In the event said identification badge has not been issued by the Contractor, all employees of the Contractor and every subcontractor must produce a valid form of government-issued photo identification promptly upon request of the Campus. Failure to display such identification or to display or produce such identification in the manner as prescribed by the Campus may result in the employee's non-admittance to or immediate removal from the Site.
   b. The Contractor and his/her workers, employees, subcontractors and their workers, etc., will not fraternize with any building or Campus occupants. This includes, but is not limited to, students, faculty, and employees of the State other than those designated contacts for this Project, visitors and guests.
   c. At no time will it be appropriate to say, write, or gesture anything derogatory to or about any individual(s). Harassment, verbal or otherwise, of any individuals will not be tolerated. Within two business days after receipt of the Consultant's direction, remove any postings, defacement, marking, carving, graffiti, or other non-Contract related information on Site at no additional cost to the Fund.
   d. Alcoholic beverages or illegal drugs are not permitted on this Project. Smoking may be permitted where it is permitted by Campus regulations and controlled in accordance with the Fire Code of New York State, except that smoking shall be prohibited throughout demolition work areas and where recommended by NFPA 241 Annex A, Explanatory Material.
   e. Radio playing is disruptive to building occupants and is not permitted.
   f. If worker(s) fail to properly adhere to the Code of Conduct or fail to follow safety or other regulations, the Contractor will be directed to permanently remove the worker(s) from the site and replace the worker(s) at no additional cost to the Project.

   ID Badges:

   g. All Contractor onsite personnel are required to furnish and wear identification badges at all times on Campus. The badge shall be formatted similar to a driver's license and include the following:
      1) Photograph of Employee
      2) Name of Employee
      3) Name of the Company
      4) Trade
      5) Project Name:
   ii. Badge shall be laminated in clear plastic
   iii. Format shall be approved by the Consultant and consistently employed throughout the project.

7. The building shall not be left "open" overnight or during any period of inclement weather. Temporary weather tight closures shall be provided for by the Contractor to protect the structure and its contents.

   a. Provide an emergency plan to secure the Work site during severe weather.

b. As part of the base bid, for ambient exterior weather conditions, include all reasonable materials, labor and equipment, which may be in addition to those required for the work, to implement the emergency plan for conditions up to the 95th percentile recorded seasonal conditions recorded at the nearest National Weather Service site.

   i. For conditions meeting or exceeding the 95th percentile, the additional reasonable labor, material and equipment required to implement the emergency plan may be paid for by Field/Change Order when the Consultant determines that such additional labor, material and equipment could not have been reasonably anticipated in the base bid emergency plan.

c. As part of the base bid and Article V of the Agreement, for damages caused by ambient exterior weather conditions, provide all reasonable materials, labor and equipment, which may be in addition to those required for the Work and/or required to perform stabilization, removals and corrective Work caused by severe weather.

   i. For conditions meeting or exceeding the 95th percentile, the additional time required for corrective Work may be paid for by Field/Change Order when the Consultant determines that such time could not have been reasonably anticipated in the base bid emergency plan.

d. The plan shall describe:
   i. how weather conditions will be monitored,
   ii. which forecast weather conditions require emergency preparations,
   iii. what emergency preparations are required during the anticipated conditions of the job site during the time of the work, including removal of precipitation, securing materials, chemicals, temporary facilities work in place and other steps that could be reasonable anticipated,
   iv. when such emergency preparations will be implemented,
   v. who will implement the preparations,
   vi. who will check the completed preparations to confirm they meet the intent of the plan,
   vii. who will communicate the plans to local emergency responders,
   viii. how the site will be monitored during severe weather,
   ix. who will be on standby to return to the site when permitted by local emergency responders,
   x. how the damage, if any, will be assessed.

e. The emergency plan shall be available for review by the Consultant within four (4) hours or less notice during non-working hours and within thirty (30) minutes during working hours.

01 35 13 10 Salvage of Materials

1. Remove and legally dispose of all debris and other materials resulting from the alterations to State University property. The following items shall remain the property of the Campus and shall be stored at the site as directed by the Consultant:

01 35 23 Safety and Protective Facilities

1. The Contractor shall provide the necessary safeguards to prevent accidents, to avoid all necessary hazards and protect the public, the Campus staff, students, visitors, the work, and property at all times, including Saturdays, Sundays, holidays and other times when no Work is being done. The Contractor's Safety Procedures Manual shall be certified by a Certified Safety Professional from the Board of Certified Safety Professionals (www.bcsp.org).

a) Prior to beginning any Work on site, submit an OSHA compliant site specific Safety Procedures Manual that identifies all site-specific safety issues related to this Work and details how each will be addressed. In accordance with OSHA, hold weekly "Tool Box" meetings with jobsite personnel to discuss safety and fire prevention topics as required by NFPA 241 and as recommended in its Annex A, Explanatory Material.

b) Provide the appropriate "competent" person(s) (as defined by OSHA) on site during the performance of work.

2. The Contractor shall erect, maintain and remove appropriate barriers or other devices, including mechanical ventilation systems, as required by the conditions of the Work for the protection of users of the project area, the protection of the Work being done, or the containment of dust and debris. All such barriers or devices shall be provided in conformance with all applicable codes, laws and regulations, including OSHA and National Fire Prevention Association (NFPA) 241, for safeguarding of structures during construction. Provide a copy of NFPA 241 for use on site during the work. Barriers shall be made from noncombustible and/or fire retardant materials. As appropriate to the risk and when requested, provide periodic inspections of the safety and protective facilities by competent individuals. Promptly correct any deficiencies observed.
   a) Prior performing any removals or construction that impairs free egress from existing building exits to areas of refuge remote from the buildings, complete the installation of all temporary fencing, barricades and walkways. Install temporary egress, stairs, ramps and paths around Work areas that comply with the Existing Building Code of NYS, Chapter 15 - Construction Safeguards.
   b) Sequence the construction Work to minimize the relocation of the above barriers and walkways. Install, relocate and modify the construction safeguards, barriers and covered walkways as required to perform the Work in a manner that limits the temporary closure of any egress path to the least amount of time possible. If any egress path requires closure that is not shown on the drawings, that closure may not be able to occur during normal business hours of the buildings. Where permitted by the Code and if approved by the Campus and the Consultant, portions of interior corridors, aisles and passageways may be closed for limited time periods if such portions are under continuous supervision of the Contractor and the Contractor has a reasonable plan to divert and direct exiting occupants during an emergency.
      i) When existing stairs are not available for the Contractor's use, provide a stair when construction Work areas are four stories above or below the exit to staging areas on the adjacent grade. The existing/permanent stairs of the Project may be used by the Contractor if the stairs are in essentially new/repaired condition prior to the Fund's acceptance of the structure. Where the existing/permanent stairs are not available for the Contractor's use, provide a noncombustible temporary stair meeting the following requirements:
      ii) Clear width of stair and landings shall be 36" with 6'-8" clear headroom
         i. Riser height shall not exceed 7" and tread width shall not be less than 11".
         ii. Handrails shall be on both sides between 34" and 38" above tread/landing, be continuously graspable and have a 1 ¼" circular cross section.
         iii. Each level will have clear signage identifying the level, stair and exit path.

   c) Prior to starting demolition, to maintain occupied spaces with their current services and utilities, trace all services and utilities, identify their respective areas and zones of service, both within the Work area and outside to Work area. Two weeks prior to start of demolition, submit a written plan for each service and utility describing how such services and utilities will be temporarily maintained, shutdown, disconnected and cut, and/or permanently reconnected. Field tracing, testing and identification of services and utilities that requires their temporary shutdown will be done after hours or on weekends.

1) The plan should clearly identify any impairment of fire protection system(s), exit signs, exit lighting and/or other code required life safety systems. Add dates and durations of impairments to the Project Schedule.
2) The Project Schedule should allow for the presence of the Campus Fire Prevention Program Superintendent at the time fire protection system(s), exit signs, exit lighting and/or other code required life safety systems are shut off and at the time such systems are restored to partial/full service.

b. When moving any items (materials, equipment, supplies, tools or other items) through exits, exit access spaces and site areas shared with the Campus during occupied hours, provide radio equipped flagger(s) whose sole responsibilities are: (1) to direct pedestrian and vehicular traffic as required to permit the safe transport of the items from the staging area to the Work area; (2) to inspect the paths traversed to confirm that they are clean, safe and ready for the Campus to resume using; and (3) to confirm that gates, doors, fences, barricades and other temporary controls intended to separate the public from the area(s) controlled by the Contractor are properly restored.

d) Other than materials required for a work shift, storage of materials shall not be permitted in building spaces shared with the Campus. Do not leave any materials, equipment, partially installed work, etc. in a manner that prevents full operational access by the Campus to the spaces outside the areas controlled exclusively by the Contractor. Only the material which can be used in one shift shall be moved into the spaces shared with the Campus. All other material shall be stored in the areas exclusively controlled by the Contractor. During the work shift, materials, tool boxes, etc. may be dispersed throughout the Work locations shared with the Campus, as required to perform the work, but shall be continuously attended to, neatly organized and located in a manner that does not create tripping hazards and/or reduce the clear travel path of exits and exit access spaces. All tools and excess material, if any, dispersed through the Work locations shared with the Campus shall be collected prior to the end of each shift and moved to the approved staging area.

e) The contractor shall leave the interior building access path to and from the Work areas vacuum clean after the completion of each day's work.

3. Fire safety during construction:

a) If required by the nature of the Work and Campus regulations, the Contractor shall obtain from the Campus and pay all costs associated with "Confined Space Permits" or "Hot Permits" to execute the Work of its contract. Perform hot work in accordance with the Fire Code of New York State and the Hot Work Program approved for the work. Prior to, during and after performing hot work, inspect the hot work area for compliance with the requirements of the permitted Hot Work Program.
(Insert public web site address for Campus forms) <u>or</u>
See applicable permits and conditions bound elsewhere in this Manual (01 00 00 General Requirement Reference Documents).

b) Take all reasonable precautions against fire in accordance with good fire engineering practice. Provide all temporary plans, maintenance, programs, equipment, labor and material required for compliance with the applicable provisions of the Fire Safety During Construction and Demolition chapter of the Fire Code of New York State (FCNYS) in the New York State Uniform Fire Prevention and Building Code.

c) For areas and spaces under their control, the Contractor shall comply with applicable provisions of the Fire Safety During Construction and Demolition chapter of the Fire Code of New York State (FCNYS) in the New York State Uniform Fire Prevention and Building Code. The Campus Fire Prevention Program Superintendent will develop a project specific Fire Prevention Program required by Chapter 33 of the FCNYS. The Contractor's superintendent shall be responsible for reviewing

the Fire Prevention Program for coordination with the Contractor's Work plan, adhering to the provisions of the Fire Prevention Program and implementing the minimum safeguards for construction, alteration, and demolition operations that provide reasonable safety to life and property from fire during the Contractor's operations. The Contractor's superintendent shall also cooperate with the Campus Fire Prevention Program Superintendent, respond to questions raised concerning fire safety and take prompt action to correct conditions which do not meet the applicable provisions of the Fire Safety During Construction and Demolition chapter of the Fire Code of New York State (FCNYS) in the New York State Uniform Fire Prevention and Building Code and the project specific Fire Prevention Program.

d) Use noncombustible material (metal or fire retardant material) for scaffold, trash chutes, forms, shoring, bracing, temporary stairs, ramps, platforms and boxes when such items are required during the work
e) When permanent sprinkler and/or standpipe systems are installed as part of the work, sequence the installation of these systems in a manner that closely follows the construction work, allowing the systems to be partially or fully operational within construction Work areas, as required by NFPA 241 and as recommended in its Annex A, Explanatory Material. When permanent/existing sprinkler and/or standpipe systems are modified as part of the work, sequence the modifications of these systems in a manner that minimizes the duration of time for impairment of the systems.

f) The "Construction Fire Safety Weekly Review" form and other documents that may be developed by the Campus Fire Prevention Program Superintendent may be used during the inspection program required by NFPA 241 7.2.4.4. A copy of the Construction Fire Safety Weekly Review is bound elsewhere in this Manual.
g) Be responsible for dust control and cleanup. Provide dust curtains, ventilation and negative air machines when grinding or cutting inside the building. Use enclosed chutes whenever materials are dropped more than 10 (ten) feet.
h) All extension cords, cables and hoses shall be maintained at least 6 feet 6 inches above the working floor. Where this is impossible, these items shall be inspected daily and repaired immediately or tagged and removed from use until repaired.

i) Store flammable and combustible liquids and flammable gases used during the Work in compliance with the Fire Code of New York State.

01 35 23 10 Safety Data Sheet

1. The contractor shall submit SDS (Safety Data Sheet) for all chemicals, solvents, and materials specified or proposed to be used on this project.

01 35 29 10 Public Health/Safety Requirements and Guidance for Construction Jobsites

1. The Contractor shall comply with any and all health and safety requirements issued by federal, state or local entities, including but not limited to New York State Governor Office Executive Orders, New York State Department of Health rules, regulations and guidance, and other New York State, Fund or Campus laws, rules, regulations or requirements in effect at the time of the bid. Such health and safety requirements are made a part of the Contract Work for this Project. All costs and time associated with compliance with such health and safety requirements are included in the Contract consideration in Article IV of the Agreement.

01 35 43 Environmental Procedures

1. Employ measures to prevent creation of air pollution and odors.

   a) On interior Work and Work adjacent to occupied areas, all passageways and vent systems will be sealed to prevent dust, air pollution, and odors from traveling into occupied areas. Take measures to ensure proper separation in accordance with Section 01 35 23. Ensure that the integrity of the separation is maintained throughout the period of the work. In the event any trade must remove a barrier in whole or in part, it is their responsibility that the barrier is reconstructed at the end of each Work period.

   b) Perform exterior Work adjacent to air intakes, doors, windows and/or other passageways that may convey odors but cannot be sealed without impacting Campus operations during weekends, second or third shift or other off hour periods that mitigates the impact to Campus operations. Seal openings with fire-retardant poly tenting or equivalent. Allow sufficient time to install temporary barriers at the beginning of each off-hour period and remove barriers at the end of each off hour period.

   c) If the emission of construction related odors is found to be offensive by building staff, Work will stop and effects to effectively exhaust the odors will begin immediately. Continuance of the odor causing Work will be permitted during non-occupied times.

   d) No gasoline/diesel powered engines are permitted inside a Campus building.

01 35 73 Delegated Design

1. At the request of the Consultant and in compliance with the Rules of the New York State Board of Regents, the Fund has allowed the Consultant to delegate to the Contractor certain portions of the design of the work. These portions are listed below in the Schedule of Delegated Design. For portions of the Work where design has been delegated, the Consultant has provided, elsewhere in this Project Manual, the complete parameters which the design must satisfy and other requirements. The Contractor shall assign responsibility for the design of the delegated portions of the Work to person(s) who are New York licensee(s), or otherwise authorized, who shall sign and certify his/her design work and who are approved by the Consultant.

2. Schedule of Delegated Design in the Technical Specifications:

Project No. 081056-00
Project Title: Renovate
Peregrine Dining Hall

Section Number	Section Name	Description of Delegated Design (See Section for complete details)
05 10 00	Structural Steel	Connections calculations and shop drawings stamped by licensed professional engineer.
05 40 00	Cold Form Metal Studs	Manufactured engineered components, supplier expertise/preference – Design cold form metal framing, trusses and connections.
05 51 00	Metal Stairs	Shop drawings signed and sealed by a licensed professional engineer.
05 52 00	Metal Railings	Shop drawings signed and sealed by a licensed professional engineer.
07 42 13	Metal Wall Panels	Shop drawings for attachments and anchors signed and sealed by a professional engineer.
08 43 13	Aluminum Framed Storefronts	Shop drawings and calculations for structural support framing, signed and sealed by a professional engineer.
23 05 23	Hangers and Supports for HVAC Piping and Equipment	Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria.
23 31 13	Metal Ducts	Duct construction, including sheet metal thickness, seam and joint construction, reinforcements, hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards- Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" article.
26 22 00	Low Voltage Transformers	Design Low Voltage Transformer mounting rack dunnage for interior installations. Provide comprehensive engineering design analysis and framing drawings as performed by New York State Licensed Professional Engineer. Provide detailed shop drawing submittal with complete drawings and design analysis for each transformer installation

Note: The above list provides a general summary of work delegated in the technical specifications an may not be all inclusive. In case of conflict or omission, the requirements of the technical specifications take precedence over the above list.

01 41 13 Code Compliance and Testing (In addition to Section 2.10 of the Agreement)

1. The Fund, if the same is required by law, will issue a Building Permit for this Project. The project is not subject to any local building code or permit requirements, except for Work that the Contractor is to perform on property located outside of the boundaries of the campuses of the State University of New York or on systems or equipment within the boundaries that are owned or controlled by others such as utility companies.

2. Special Inspections: This project may contain Work requiring Special Inspections in accordance with the Building Code of New York. The Fund and the Consultant shall exercise control to verify that the construction conforms to the Contract documents. In addition to the requirements of Section 2.17 of the Agreement, cooperate with and provide safe access for inspection and testing agencies, as reasonable to allow inspections and tests to be performed. This will require the Contractor to provide and attend to / operate scaffolding, ladders, or lifts. This project may also contain Work requiring the construction of a main wind- or seismic-force-resisting system, designated seismic system or a wind- or seismic-resisting components and the Contractor shall have provisions for quality control.

   a) See the Statement of Special Inspections bound after this Section for the project specific Special Inspections program.
   b) Prior to start of Work that requires code inspections, schedule pre-inspection meeting with the Consultant, Fund and Campus review required inspections and how and when they will be performed.
3. All Work involving installation and modification to fire alarm systems shall be performed by individuals or firms currently licensed by the NYS Department of State, Division of Licensing Services. The contractor shall provide copies of the individual's or firm's current license and identification cards for all unlicensed employees performing work for the licensed individual or firm for this project. The Contractor shall post a copy of the license at a location approved by the Consultant.

4. In addition to the requirements of Section 2.17 of the Agreement, before performing system tests, partial system tests or scheduling inspections for fire alarm, fire suppression, electrical, mechanical, plumbing, elevator, site infrastructure and other work that must be completed for a Temporary Authorization to Occupy and/or a Code Compliance Certificate, attend pre-test and inspection meetings for each system with the Consultant.

   a) Provide a list of all Contractor provided tests that are specified in Divisions 1 through 48, inclusive, and list portions of large systems tested separately (see 01 74 00, Clean-Up, for separation criteria), who will perform a test, when it will be done, who witnessed it and when, results (pass/fail), follow up action, comments and other information requested by the Consultant.

   b) The Consultant will review the scope of inspection of the as built installation, review the completeness of the record drawings per Section 2.24 of the Agreement, review the scope applicable tests and review the applicable forms that will be completed as part of the testing and inspection.

   c) Immediately after completion of tests, provide original forms with all information filled out plus six copies to the Consultant. Systems required for Substantial Completion will not be considered completed and accepted until all code required forms are completed, submitted and reviewed by

Consultant for completeness. For fire protection systems, provide the Statement(s) of Compliance required by Fire Code part 901.2.1.

d) Where portions of systems are completed and ready for testing and inspection, those portions will not be considered completed and accepted until all code required forms are completed to the extent applicable to the portion of Work completed, submitted and reviewed by Consultant for completeness.

e) Where portions of systems are excluded from the portions being tested, provide additional Work required to functionally extend systems around the excluded portions and to fully separate the tested portions from the excluded portions.

f) Schedule testing that requires safety clearance or impacts Campus activities (such as, but not limited to, x-ray testing of welds) and/or testing that requires utility shutdowns for weekends, holidays and/or 2nd or 3rd shift, as appropriate to accommodate the Campus and mitigate disruption to Campus activities.

g) Unless otherwise approved by the Fund, all Contractor provided tests that are specified in Divisions 1 through 48, inclusive, must be witnessed and signed off by the Consultant prior to acceptance of the tested work; and, in the Contract Breakdown required by Section 4.08 of the Agreement, the scheduled value of Contractor provided tests shall be 5% of the amount estimated for the Work being tested.

h) In addition to the above testing, and if mechanical, hot water and/or lighting control systems are included in the work, cooperate with the Consultant to complete the commissioning of mechanical, hot water systems and functional testing of lighting controls. Provide a single competent person as the point of contact for all commissioning required in this contract. As applicable, provide workers, equipment, computer programming, fuel, power, means of access, operating instructions and manuals (see Section 01 78 23) and other work required to demonstrate installation, operation, functionality, calibration and other performance criteria of such systems.

01 41 16 Laws

1. "Diesel Emissions Reduction Act of 2006 (the “Act”):

   a. Contractor certifies and warrants that all heavy duty vehicles, as defined in New York State Environmental Conservation Law (ECL) section 19-0323, to be used by the Contractor, its Agents or Subcontractors under this Contract, will comply with the specifications and provisions of ECL section 19-0323 and any regulations promulgated pursuant thereto, which requires the use of Best Available Retrofit Technology (“BART”) and Ultra Low Sulfur Fuel (“ULSD”), unless specifically waived by DEC. Qualification for a waiver under this law will be the responsibility of the Contractor.

   b. Annually, in the cycle determined by DEC and the Fund, the Contractor shall complete and submit directly to the Fund, via electronic mail, the Regulated Entity Vehicle Inventory Form and Regulated Entity and Contractors Annual Report forms at the Department of Environmental Conservation (“DEC”) website for heavy duty vehicles used in the performance of this Contract for the preceding calendar year. Periodically, as requested by the Fund, the Contractor shall certify and submit the Contractor and SubContractor Certifications form, which states that the Contractor will comply with the provisions of Section 20.23.

      Website: http://www.dec.ny.gov/chemical/4754.html
      Inventory Form: https://www.dec.ny.gov/fs/docs/spreadsheets/248inventory.xlsx

Annual Report Form https://www.dec.ny.gov/fs/docs/spreadsheets/248annrptfrm.xlsx

2. Comply with Labor Law Section 220-h; provide workers certified as having successfully completed the OSHA 10-hour construction safety and health course; and comply with the applicable NYS DOL rules and regulations for monitoring and reporting compliance.

3. Title 10 of the New York Codes of Rules and Regulations (10 NYCRR), Part 4, "Protection against Legionella"
   a. If the project involves the installation or modification to a "Cooling Tower" as defined per the NYCRR, the Contractor is responsible to provide maintenance, testing and reporting. These responsibilities begin upon startup and operation of the "Cooling Tower" or anytime it contains water, it shall continue until the date of the end of the "one-year guarantee period" as defined per Section 2.25 of the Agreement.

      i. The Contractor's maintenance program and testing plan shall be submitted to the Fund, Campus and the Consultant for review and approval.
      ii. The Contractors testing services shall include routine and immediate bacteriological and Legionella culture sampling and analysis as required per the NYCRR. It shall also meet all the requirements in the Campuses "Cooling Tower" maintenance program and plan developed for compliance with 10 NYCRR.
         1. Documentation of all maintenance, testing and reporting of the results shall be provided to the Fund and the Campus.
      iii. Copies of all maintenance and testing records shall be kept on the premises where the "Cooling Tower" is located.

01 51 13 Temporary Power for Construction Activities

a. Electrical energy, as/if it exists within the Work area may be used for small power tools, etc. (≤1/2 HP), without metering and at no cost to the Contractor. Usage shall be limited to existing outlets and/or panels within the Work areas shown or as approved by the Campus. The Contractor shall not exceed the capacity of the existing circuits being used. The Contractor shall be responsible for providing all necessary connections, cables, etc. and removal of the same at completion of construction with approval from the Fund. The Contractor shall in no way modify the existing circuits at the panel boards to increase capacities of the circuits. If the required power load exceeds the capacities of the available power sources, the Contractor shall provide and maintain all necessary items to provide temporary power for the project and remove at completion. Install all temporary wiring and equipment and make all connections in conformity with NYS Uniform Fire Prevention and Building Code, National Fire Protection Association, National Electric Code, and all other applicable codes. Make all replacements required by temporary use of the permanent wiring system. Provide ground fault protection.
b. If, for any reason, the permanent power with necessary cable and connections is not available in time to test out the various mechanical and electrical systems of the Project at the time of its scheduled completion, the Contractor shall provide, maintain, and keep in use sufficient temporary power facilities until such permanent power is tied in and fully energized.

01 51 16 Temporary Fire Protection

1. If the existing building is to be partially occupied during the course of the project, all existing exits except those shown for closure, fire walls, fire barriers and fire protection systems shall be continuously maintained in the occupied phases in compliance with the Fire Code of New York State and as required by NFPA 241 and as recommended in its Annex A, Explanatory Material, or other measures must be taken which in the opinion of the Consultant will provide equal safety. Those portions occupied by the Campus must be available for their use 24 hours a day, seven days a week during the Contract period unless otherwise scheduled in these documents. Comply with all applicable State and Federal codes and regulations. Prior to removal of existing fire walls, fire barriers and fire protection systems, if such removal is part of the work, install equivalent temporary fire walls, fire barriers and fire protection systems. The cost of all labor, fire watches, variances, materials, installations, maintenance and removal of such temporary fire protection systems or modifications to the existing systems are the responsibility of the Contractor. Install permanent fire walls, fire barriers and fire protection systems, if provided as part of the work, as soon as practical and as required by NFPA 241 and as recommended in its Annex A, Explanatory Material.

2. Solid fuel salamanders and heaters shall not be used by the Contractor or any of its subcontractors. For all other salamanders used by the Contractor or any of its subcontractors, attend to their operation with competent persons in each space where in use.

3. All temporary fabric used by the Contractor or any of its subcontractors for curtains, awnings or other uses shall be either non-combustible or flame retarded so that it will not burn or propagate flame.

01 51 23 Temporary Heating and Cooling

Provide temporary HVAC in the entire Work area(s) as soon as practical. Existing HVAC system, if available, may be utilized to provide some or all temporary HVAC.

1. When the building or significant portion of the building is enclosed, use temporary HVAC to maintain environmental space conditions within specified parameters, to cure or dry completed installations, to protect installed/existing materials from adverse effects of temperatures or humidity levels, and/or to prevent freezing of hydronic systems.

2. When the building or portions of the building is unenclosed and as required to properly perform the work, protect existing building/work in place, and/or maintain environmental conditions within specified parameters, provide suitable temporary enclosures, weather protection, additional temporary HVAC, and other temporary work.

1. If an existing HVAC system exist within the Work area, it is available for use by the Contractor. It is the Contractor's responsibility to determine if the existing HVAC will be able to provide the minimum temperature and humidity levels required during the work; otherwise, provide a temporary HVAC system(s) as required to supplement deficiencies in the existing HVAC system.
2. Temporary HVAC shall be installed, extended, modified, operated, and maintained by the Contractor until Substantial Completion.
   a) Where existing HVAC systems in the Work area(s) rely on Campus controlled portions, the Campus will continue to operate and maintain their portions in the same manner performed prior to bidding. With Campus permission, Contractor may rebalance Campus controlled portions.
   b) Where existing HVAC systems outside the Work area(s) rely on Contractor controlled portions, the Contractor will operate and maintain its portions in a manner that properly maintains the service required by the Campus and comply with Section 01 18 13 Utility Shutdowns and Cutovers for

planned outages. Unplanned outages shall be addressed in the emergency action plan required in Section 01 35 13 Conducting Work. When directed by the Consultant, rebalance Contractor controlled portions as required to provide proper service to systems outside the Work area(s).

3. Temporary HVAC shall be capable of maintaining temperatures between 68°F to 78°F and relative humidity's below 55%, unless otherwise specified by the Contract Documents. If materials being installed, finished and /or maintained require stricter temperature and relative humidity's ranges per the material manufacturer(s) written recommendations, provide additional temporary HVAC to provide manufacturer required conditions during the time periods recommended by the manufacturer(s).
4. To monitor and record temperature and humidity levels, provide a minimum of two (2) data loggers per Work area plus one additional data logger for each additional 5,000 square foot of Work area.
   a) The initial location of the data loggers and any relocation required during the progression of the project shall be as directed by the Consultant.
   b) Periodically transfer electronic data, change batteries, and perform other maintenance needed to keep the data loggers functional at all times during the work. Show the locations, date installed, and date moved in records available upon request of the Consultant. Also upon request, provide the electronic data shall to the Consultant.
   c) Data loggers shall be HOBO MX1101 by Onset or equivalent with Accuracy: +/- 0.2C and +/- 2%RH
5. The Contractor is solely responsible for damages to existing/new work, materials and/or equipment within the Work area(s) caused by the failure of the Contractor to maintain the required environmental space conditions temperature and humidity levels. Damaged materials and/or equipment shall be replaced to the satisfaction of the Consultant and at the sole cost and expense of the Contractor.
6. Temporary HVAC systems shall comply with NYS Uniform Fire Prevention and Building Code, National Fire Protection Association, and all other applicable codes.
7. The permanent HVAC system of the Project may be used by the Contractor, with the approval of the Consultant and the Fund, to provide temporary HVAC. In the event the Contractor so uses the permanent HVAC system:
   a) It must place said system in perfect working order and in essentially new condition prior to the Fund's acceptance of the Project.
   b) The period of the guarantee of the permanent HVAC system will commence at the time of the Substantial Completion of the Project.

01 51 26 Temporary Light

1. Provide temporary lighting in the entire Work area(s) as soon as practical. Existing lighting, if available, may be utilized to provide some or all temporary lighting. Extend/relocate/modify/maintain temporary lighting to suit progress of work.
2. Provide a minimum of 10-foot candles in the entire Work area(s) as measured at the floor level. In stairs and exit aisles/paths/ways, maintain lighting levels for 24 hours, 7 days per week; in all other spaces, maintain temporary lighting during working hours.
3. All temporary lighting shall comply with the NYS Uniform Fire Prevention and Building Code, National Fire Protection Association, National Electric Code, and all other applicable codes.
4. Unless otherwise directed by the Consultant, operate and maintain temporary lighting until Substantial Completion.

01 51 36 Temporary Water for Construction Purposes

1. Water for construction is available through the Campus system with charge to the Contractor from location designated by the College. The Contractor shall obtain the necessary permission, make all connections, as required, furnish and install all pipes, fittings and reduced pressure zone backflow prevention device (tested before use), insulate piping, and remove the same at completion of work. The Contractor must provide for waste water discharge and shall take due care to prevent damage to existing

structures or site and the waste of water. All pipes and fittings must be maintained to the satisfaction of the Campus at all times. Temporary water system shall comply with the Fire Code of New York State.

01 52 13 Field Office for the Consultant

1. Coordinate the specific requirements for the field office with the Fund's Construction Unit. This coordination should occur at the constructability meeting held prior to the submission of Construction Documents. Locate the field office on the site plan and shown all temporary utility connections and setbacks from existing and new buildings as required by NFPA 241 Table 4.2.1.

Within two (2) weeks of receipt of the Notice to Proceed, provide for the services and new equipment listed below at the existing field office space used by the Site Representative(s):
1. Provide <specify> cellphone(s) with unlimited wireless and data services equivalent to <specify>.

2. Provide one (1) "all-in-one" printer/copier/fax/scanner with networking capabilities similar to <specify> with network and phone devices, cables, toner cartridge(s), and monthly service contract for the duration of the job.

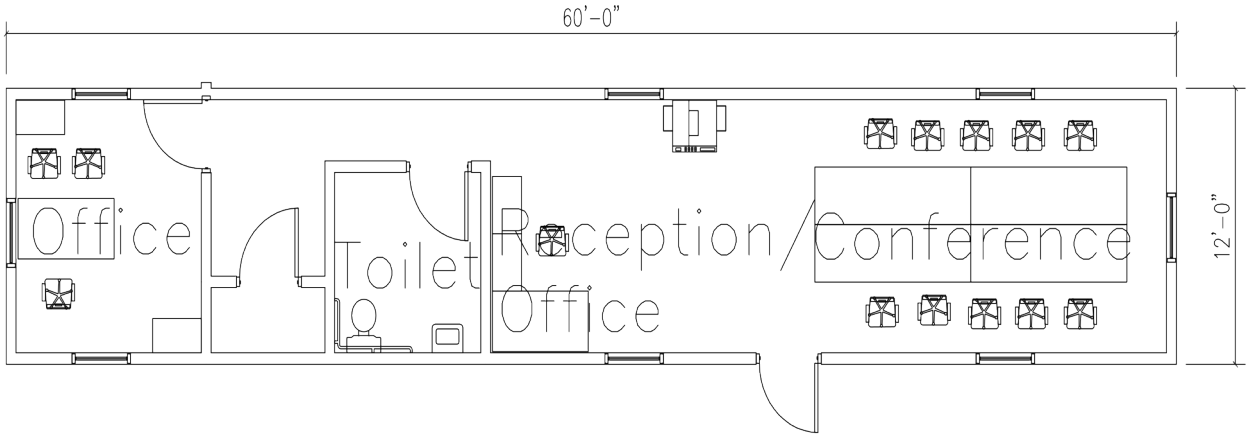
3. Provide one (1) drinking water cooler with water and disposable cup supplies for the duration of the project.

4. Provide supplies as follows: <specify>
   a. For each month in the scheduled duration, provide <specify> boxes of copier paper (<specify> with letter size, <specify> with legal size, and <specify> with 11 x 17 size).
   b. Provide a service contract for existing photocopiers and printers <specify>, including all toner cartridge(s) and monthly service contract for the duration of the job.

All of the above items are to become the exclusive property of the Campus at the end of the project. Prior to purchase, submit detailed information for the above items to the Consultant for approval. Prior to removal of any computer equipment, phone, tablet and/or data storage device, the Contractor shall provide the services of a firm experienced in computer services to visit the field office when directed by the Consultant, permanently erase and delete all data stored on such equipment and demonstrate to the Consultant that all data has been permanently deleted. The Contractor is not responsible for all expendable office supplies except for those specifically noted above.
The Contractor, until all the Work covered by the Contract is accepted by the Fund, shall provide and maintain a temporary, relocatable office structure completely separate from the Contractor's or other field offices on the site, with interior sanitary facilities, including a lavatory supplied with hot and cold water and a flush toilet, a heating system, a lighting system, internet access, and a separate telephone service. Construct and install the structure in compliance with Section 3113 of the Building Code of NYS and the Fire Code of New York State. Provide certification insignia from New York Department of State that certifies trailer unit is code compliant. This structure shall be new and for the exclusive use of the Consultant. The Contractor shall bear the cost of constructing, furnishing, maintaining, keeping clean, and, at the completion of all work, removing such structure and its furniture, fixtures and equipment. The structure shall be of such size and furnished and equipped with such facilities as are hereinafter listed:
1. Minimum of 360 sq. ft. as shown below:

2. Office furniture shall be new and consist of the following items:

1. Minimum of 720 sq. ft. as shown below:



2. Office furniture shall be new and consist of the following items:

Two (2) desks equal to HON model number H38934 with center draw and side return H38943R, and two (2) swivel desk chair HIWMI.

Four (4) desk cabinets similar to HON HI9723R and HI9823R. Provide racks and ten (10) hanging folders in each file drawer.

a. Two (2) Desktop PC (equivalent to Dell Inspiron 5000) each with dual monitors (equivalent to 24 inch with Inspiron and Dell 19 monitor). For each PC:
    1. Provide a desktop subscription to AutoDesk for the software need to review coordinated drawings.
    2. Provide monitor stand, mounting hardware, keyboard, mouse, mouse pad, speakers, HDMI cables, USB cables, other cables for a fully functional system,
    3. Provide Windows 10 and Office 365 subscriptions.
    4. Provide surge protection station, connections to printers and copier, and an internet connection.
    5. Provide setup and service contracts/subscriptions for all hardware and software for the duration of the job from a firm experienced in computer services.
b. One (1) "all-in-one" copier/fax/scanner with networking capabilities similar to Canon ImagePress C710CA with network and phone devices, cables, toner cartridge(s), and service contract for the duration of the job.
c. One (1) printer, with printer cables and network cards equal to HP LaserJet Enterprise 700 color MFP M775z.
d. Three (3) touch-tone phones (one phone shall have speaker phone capability), and an answering machine.
e. Four (4) 24” x 72” conference tables equal to HON model number HMT2472G and HMBFLIP24L .
f. Twelve (12) conference table chairs equal to HON model number HIGS6.
g. Four (4) four-drawer legal size file cabinets similar to HON model number H9194R. Provide racks and ten hanging folders in each drawer.
h. Two (2) four shelf bookcases equal to HON model number HS60ABC.
i. Two (2) 48“ by 36” wall mounted dry erase board and one each red/blue/green/black markers.
j. Three (3) trash baskets.
k. Two (2) 5-lb. ABC fire extinguishers.
l. One (1) drinking water cooler with water and disposable cup supplies for the duration of the project.
m. One (1) digital camera equal to an Olympus Stylus Tough TG-4 digital camera with two (2) additional compatible 32 GB memory cards.
n. Ten (10) 32 GB Flash Drives
o. Push broom, mop, janitor’s bucket and two exterior entrance rugs and two interior entrance rugs.

p. Supplies as follows: For each month in the scheduled duration, provide <specify> boxes of copier paper (<specify> with letter size, <specify> with legal size, and <specify> with 11 x 17 size).
q. Two (2) desk lamps with replacement bulbs for each.
r. Two (2) 3'x5' tack board and four boxes of tacks.
s. Two (2) tape dispensers with 12 boxes of tape.
t. Two (2) staplers with 10 boxes of staples and two staple pullers.
u. Two (2) electric pencil sharpeners.
v. Two (2) 2-hole punchers and Two (2) 3-hole punchers.
w. Four (4) hard hats, adjustable, plus safety glasses and vests.

Toilet facility - one unisex toilet room.

3. Heating, ventilating and air conditioning sufficient to heat and cool the entire trailer, including all required power, data, interior and exterior lighting, utility connections, disconnections and utility costs for the duration of the project.
5. Security grates for all windows; dead bolts on all doors or other acceptable secure locks.
6. Insulated skirting from bottom of unit to grade, around entire unit. Skirting is to be 2’ x 4’ fire retardant, decay resistant wood framing with 2” rigid insulation type SM and white ventilated vinyl siding to match unit.
7. Snow removal as specified in Section 01 55 29, Staging Area and Storage of Materials.
8. Weekly janitorial services
9. Separate telephone service (two handsets with speakerphone, voicemail and call waiting). Include all Campus, toll, taxes and/or other service charges.
10. Separate unlimited data internet service by DSL, cable, fiber or 4G wireless with modems, routers, access points, and connections for all internet connected equipment provided in the field office plus concurrent wireless access for at least ten (10) additional users. Download speed shall be at least 25 megabits per second and upload speed shall be at least 10 megabits per second.

11. All of the above items are the exclusive property of the Contractor and are to be removed from the site at the end of the project. Prior to purchase, submit detailed information for the above items to the Consultant for approval. Prior to removal of any computer equipment, phone, tablet and/or data storage device, the Contractor shall provide the services of a firm experienced in computer services to visit the field office when directed by the Consultant, permanently erase and delete all data stored on such equipment and demonstrate to the Consultant that all data has been permanently deleted. The Contractor is not responsible for all expendable office supplies except for those specifically noted above.

01 52 19 Temporary Sanitary Facilities

The Contractor shall install, maintain and, at the completion of all Work or at such earlier time as the Consultant may approve, remove temporary sanitary facilities. From the commencement of Work until the frame of the structure, if the Project involves a structure, is erected, such facilities shall be of the chemical type, shall be placed at locations approved by the Consultant and shall be screened from the Campus population/public. As soon as the frame of the structure has been erected, water supply and sanitary drainage connections shall be promptly made by the Contractor and temporary toilets, using the permanent piping system of the structure, shall be installed by the Contractor and maintained by it until completion, at which time they are to be removed by it. Permanent toilets and room finishes installed under the Contract shall not be used during construction of the Project unless the Contractor has an approved plan for periodic custodial services that maintain toilets and finishes in like new condition until their acceptance by the Fund.

The amount of sanitary facilities required shall be based on the total number of workers employed on the Project and shall be in accordance with the provisions of the Health and Sanitary Codes of the State of New York. Maintain all units in a clean and sanitary condition. At the minimum, clean on a weekly basis, and more often as required by the applicable sanitary codes for this occupancy. Provide all toilet supplies as required, including toilet paper, soap, paper towels, and waste receptors.

01 54 13 Use of Elevator(s) for Construction

1. When approved by the Consultant, the Contractor shall be permitted to make temporary use of elevators installed during the Work (if any) and existing elevator(s) designated by the Campus (if any), provided such use does not interfere with the normal activities of the Campus or exceed the capacity of the elevator(s).

2. The use for construction purposes is a new use that was not contemplated during the design of a new elevator and/or the previous acceptance inspection of an existing elevator performed for the Campus. In accordance with 8.10.5.10 of ASME A17.1, prior to using an elevator for construction, provide an inspection to confirm that the elevator installation supports the proposed new use.

3. Large and heavy items shall not be placed in elevators, and suitable padding shall be provided whenever a cab is used for construction purposes. Elevator pits shall be kept free of debris and dust by frequent cleaning out.

4. The elevators shall be maintained and restored to original condition satisfactory to the consultant and the Fund at the end of construction activities. If existing elevator(s) are used during construction, provide additional inspections and maintenance required due to construction usage. Prior to use for construction purposes, contact the existing elevator maintenance vendor and arrange for performance of the additional maintenance required due to construction usage**.**

5. If the elevator is used during construction, provide periodic inspections, as required by in accordance with Table N1, Appendix N, of ASME A17.1. Acceptance and periodic inspections shall be performed by an independent ASME A17.1 Qualified Elevator Inspector employed by a firm specializing in elevator inspection paid for by the Contractor.

6. If the project includes a new elevator(s), it may be used for construction purposes (other than elevator related construction and maintenance) when approved by the Consultant and at the point in completion of the Work when the Contractor demonstrates that there is no reasonable temporary hoist option. Submit a written request for approval describing the construction purposes, usage, loads**,** periodic maintenance, inspections, anticipated wear due to usage, emergency usage plan (if required by the local fire department), and other information that may be requested by the Consultant. Attach to the request a letter from an independent ASME A17.1 Qualified Elevator Inspector (employed by a firm specializing in elevator inspection paid for by the Contractor) recommending the proposed use(s).

   a) Immediately prior to the end of the construction use and maintenance period, clean all portions of the shafts, exterior of hoists, machine rooms and other areas accessible only to elevator technicians.

   b) Do not install the permanent flooring in the elevator until directed by the consultant.

   c) Prior to the end of the construction use and maintenance period, inspect all portions of the elevator systems, shafts and other work required for proper elevator operation in the presence of staff from

the firm providing maintenance for the Campus and perform corrective work, if any, identified during this inspection prior to the end of the maintenance period.

d) Update operating system firmware and other software to the latest applicable versions.

e) If the a new elevator is used by the Contractor for construction purposes, it shall also be made available for use by the Campus during installation of its furniture, fixtures and equipment (as further described in Section 01 11 13, Coordination with Other Contracts), unless such Campus use is inconsistent with the contractor's use as permitted in 8.10.5.10 of ASME A17.1 and contrary to the written recommendations of the Contractor's ASME A17.1 Qualified Elevator Inspector.

01 55 19 Temporary Parking

1. Unless otherwise specifically noted, there is no free parking available on Site. The Contractor and its employees shall be subject to all the rules and regulations of the SUNY Campus, including parking regulations. Parking violations are subject to fines and are the sole responsibility of the Contractor or its employees. Parking within Contract limit lines as shown on the drawings will be at no cost for the Contractor and its employees. However, if there is not enough space for all its employee parking and /or its employees choose on their own to use Campus parking spaces, additional Contractor employee parking may be permitted and arranged within Campus parking lots on a limited basis, as approved by the Campus and subject to applicable Campus traffic regulations and parking fees.

2. All vehicles are required at all times to be registered with the Campus' Public Safety Unit. Campus roads are subject to the New York State Vehicle and Traffic Laws, which shall be followed at all times by the Contractor's vehicle operators. All unlicensed work vehicles used by the Contractor shall be moved on Campus roads through one of the following methods only:

   a) Escort the unlicensed vehicle with two licensed vehicles with flashers, one in front and one behind the unlicensed vehicle.
   b) Transport the unlicensed vehicle on a licensed flatbed or other licensed transport vehicle.
3. All costs associated with temporary parking, both direct and indirect, shall be considered included in the base bid. Costs may include staging area improvements, permits, wage premiums, and contractor time, labor, effort, etc.

01 55 26 Traffic Control during Construction

1. With the award of a Contract the Campus will, unless otherwise specified, designate the sections of roadway under Contract a Restricted Highway pursuant to Section 104A of the Highway Law and Section 1625 of the Vehicle and Traffic Law. Pursuant to these legal sections, the Campus has the authority to (1) establish maximum and minimum speed limits at which vehicles may proceed along any such Restricted Highway; (2) establish weight and dimension limits of vehicles; (3) regulate the use of such Restricted Highway by pedestrians, equestrians, and animals; (4) regulate parking, standing, stopping, and backing of vehicles; (5) control persons and equipment engaged in work on such highway. When used on such Restricted Highways, all contractor-provided traffic control devices shall be considered as official traffic control devices and shall conform to the MUTCD. Signs indicating such restrictions shall be placed at such points as deemed necessary for the safe use of the Restricted Highway. The traveling public and Contractor must observe and comply with these restrictions, as posted, except that the Contractor may be allowed greater latitude with respect to size and weight of construction equipment.

2. The Manual on Uniform Traffic Control Devices (MUTCD) consists of the Manual on Uniform Traffic Control Devices for Streets and Highways (approved by the FHWA) and the New York State Supplement to the National Manual on Uniform Traffic Control Devices for Streets and Highways, as currently

amended. These documents prescribe standards for the design, location, use, and operation of traffic control devices required by this work.

3. Prepare and submit Temporary Traffic Control plans. Plan shall be prepared by persons knowledgeable (for example, trained and/or certified) about the fundamental principles of Temporary Traffic Control and work activities to be performed. Traffic control planning shall be completed for all road construction, utility work, contractor operations, and incident management prior to occupying the Temporary Traffic Control zone.

4. The Contractor shall provide all temporary signage for traffic control when necessitated by the Work in conformance with the MUTCD. Lane closures on Campus roads shall be permitted provided the Contractor maintains one lane with full access and provides radio equipped flaggers in compliance with NYS DOT “Standard Specifications”.

01 55 29 Staging Area and Storage of Materials

1. The Contractor shall store materials and equipment within the Contract Limit Lines as designated on the drawings or as approved by the Consultant, and in compliance with the Fire Code of New York State and Section 302 Property Maintenance Code of New York State. Sequence and manage the Work to account for the extremely limited space for storage and work-related activities provided in the available staging area.
2. All materials shall be stored in a neat and orderly manner and shall be protected against the weather by a weatherproof temporary storage facility or trailer. Protect material during shipping against any damage from weather, including road salt.
3. Security for stored materials shall be the responsibility of the Contractor.
4. Storage of materials is not permitted on the roof of any building.
5. The Contractor, at its expense and in compliance with the Fire Code of New York State, will be permitted to place its storage, trailer/field office(s) with appropriate utilities, and other temporary structures within the Contract Limit Lines as indicated on the drawing or as approved by the Consultant. Prior to installing and/or relocating any such structure, provide a layout showing separation distances in accordance with NFPA 241, Table 4.2.1.
6. Access to the construction Site for delivery of materials and equipment shall be as indicated on the drawings or as approved by the Consultant. Temporary parking for the loading and unloading of the same shall be arranged with prior approval of the Campus.

7. The Contractor shall always keep access routes, and parking and staging areas clean of debris and other obstructions resulting from the work.
8. If petroleum products are brought on Campus in stationary containers of 55 gallons or larger, the Contractor shall provide a certification to the Campus, stamped by a professional engineer currently licensed in New York State, that product storage, spill prevention, training, testing, inspections, handling and dispensing methods are incompliance with all applicable federal and state rules and regulations, including EPA rule 40 C.F.R. Part 112. The Campus may add the contractor's certification(s) to their Oil Spill Prevention Control and Countermeasure (SPCC) Plan as an amendment. This certification shall be provided to the Fund two weeks ahead of any product or container(s) delivery and the Campus shall be notified promptly of the removal of any container(s).
9. Prior to utilization on this project, the locations of cranes, mixers, boom trucks, forklifts, welding machines, generators, field offices, workbenches, cutters, hose lines, etc., must be reviewed in a pre-installation meeting with the Consultant. In addition, submit a complete lifting procedure safety plan, operator’s license, an annual inspection report, and a current inspection certificate for each crane, boom or lift proposed. Prior to and during any lifting, properly erect, remove, maintain and replace any required safety and/or traffic barriers.

10. Provide a chain link fence around staging, storage, parking, etc. areas that is 8'-0" high. Cover all fence fabric with black closed mesh woven polypropylene with 95% blockage and finished with binding and grommets. Reinforce posts and add additional posts and braces as required to support the additional wind load created by installation of the fabric. Secure fabric at 2'-0" by 2'-0" grid intervals and inspect and repair all attachments points monthly. Tears or holes greater than 6" in one dimension shall be repaired weekly. Minimum post size shall be as required for a 70 mph wind. Gates shall be a minimum of 20 feet across, double swing leaves with a drop rod to secure them in place while in the closed position. All gates shall include heavy duty padlocks, keyed alike, with 10 spare keys for each given to the Consultant for distribution. Provide continuous top and bottom rails. All areas within the fence shall have all grass, weeds, etc. mowed when it exceeds 6" in height. Contractor shall clear snow as necessary within fenced areas. Snow from within the fenced areas shall be moved outside the fenced areas, transported and legally disposed of offsite. Snow outside the Contract Limits will be removed by the Campus. Set fence posts and supports in the manner that facilitates the removal of snow by the Campus. True and plumb the fence posts on a monthly basis.
11. Use of Site: Limit use of Project Site to areas within the Contract limits indicated. Do not disturb portions of Project Site beyond areas in which the Work is indicated. The use of drone(s) during Work on Site is contingent on written approval from the Campus.

12. Contractor shall clear extraneous matter (snow, precipitation, wind bourn organic matter, bird/animal carcasses, etc.) from Work areas as necessary to perform work. Extraneous matter from within the Work areas shall be moved outside the Work areas, transported and legally disposed of offsite. Extraneous matter outside the Contract Limits will be removed by the Campus.

01 56 19 Noise Mitigation Measures

1. Employ the following measures during the Work of this contract:

2. Maintain all construction tools and equipment so that they operate at normal manufacturer's operating specifications, including at peak loading. Maintain noise created by tools and equipment below the levels in the noise level guidelines in the Federal Highway Administration Roadway Construction Noise Model User's Guide, as currently amended, page 3 (the Guide). If an individual piece of equipment exceeds the level specified in the Guide, then either perform maintenance to demonstrate a good faith effort, notwithstanding the model year of the equipment, to mitigate the noise by a measurable level acceptable to the Consultant, or to replace the equipment with equipment that complies with the level in the Guide.

3. Equip all tools and equipment being operated on Site with the appropriate manufacturer's recommended noise reduction device(s), including a muffler and jacket, free from air or exhaust leaks.

4. Equip specialized vehicles with noise-insulating material that does not interfere with the engine operation and/or other manufacturer recommended techniques to reduce noise. Prevent all unnecessary vehicle engine-idling on Site. Equip all vehicles with the installation of quieter backup warning devices where permitted by OSHA.

5. Cover portable compressors, generators, pumps and other such devices with noise-insulating fabric, employed so as not to interfere with engine operations, or employ other manufacturer recommended techniques to reduce noise.

    a) Implement a formal noise mitigation training program for all field-worker supervisory personnel including sub-contractor supervisors. Supervisory personnel shall field-train all field workers in an effort to minimize construction noise.

b) Cooperate with the Campus to coordinate the Work whenever possible so as to minimize the impact on the facility and use quieter devices and other noise mitigation methods, such as blankets and barriers.

6. a. For other work besides such nuisance work, to minimize disturbance to adjacent spaces occupied by the Campus, a daily "Quiet Period" will be required when the adjacent spaces are occupied by the Campus. The "Quiet Period" will be from 8:00 AM to 6:00 PM, during which time the Contractor will be restricted to performing only In addition Geothermal well drilling is to take place during the Summer when the residential halls are not in use. Work producing less than 65 decibels and less than 65 VdB in any Campus occupied area adjacent to the Work area. Occasional cyclic vibrations with duration greater than 2 seconds of not more than 0.15 in/sec may be permitted if the Contractor demonstrates that such Work is not disturbing to occupants. Use sound and vibration meters daily as needed to monitor and enforce compliance with this restriction. Provide a person(s) trained in the use of the sound meters to perform continuous monitoring and with authority to stop work that produces noise at 65 decibels or higher. Do not rely on notice from the Campus or others regarding noise exceeding this requirement.

01 57 23 Storm Water Construction Permit Responsibilities

1. The Fund is the "Operator" in accordance with the "SPDES General Permit for Stormwater Runoff from Construction Activity, GP-", as currently amended, and has obtained the specific permit for this project.

2. The Contractor and applicable subcontractors shall certify acceptance of the approved Storm Water Pollution Prevention Plan (SWPPP), provide supervision by individual(s) employed by a company who has attended a DEC-endorsed 4-hour Erosion and Sediment Control Training, provide a Trained Inspector during all periods of earth disturbance to perform the required inspections, and provide daily actions and modifications required to comply with the permit.

3. Provide the erosion and sediment controls and best management practices required to prevent soil or vegetative materials from leaving the Contract Limit Lines due to erosion by wind or water. For compliance with this permit, the Contract Limit Lines shall include the entrances to the existing and proposed storm sewer system shown on the documents. Attend a pre-construction meeting to discuss SWPPP compliance with the Campus and the consultant.

4. Provide a Qualified Inspector to provide weekly inspections, provide written reports, and notifications to the Owner as applicable

5. The Owner will retain an independent Qualified Inspector to provide weekly inspections, provide written reports, and notifications to the Owner as applicable.

   a) The Contractor shall schedule and sequence the Work so that the exposed, unprotected surface area of any earth material that is subject to erosion by wind or water will be kept at a minimum. At all locations, initiate the installation of permanent erosion control work at the earliest possible time prior to and during construction work. Submit plans documenting significant modifications to the SWPPP, as required to accommodate the preferred means and methods employed, at least two weeks prior to starting any field work.

   b) All material eroded by wind or water from within the Contract Limit Lines shall be retrieved by the Contractor. All siltation deposits in storm sewers, surface waters streams or wetlands resulting from the discharge water from the project Site shall be removed to restore profiles and conditions to that existing prior to the commencement of the work. All catch basins within the Contract Limit Lines shall be cleaned prior to the start of site work and upon completion of the project.

c) The Contractor shall keep traveled ways outside the Contract Limit Lines free of foreign objects and other items that may fall from vehicles. Promptly remove materials spilled or dropped from the undercarriage or wheels of any vehicle traveling along or across any such way.
d) On a daily basis for the duration of the earthwork, employ an experienced firm to clean pavements and roadways with a New York State licensed vacuum sweeping vehicle (Elgin or equal) that has low drive-by noise levels, is capable of sweeping debris into a vacuum nozzle with mechanical brooms located underneath the machine, has a vacuum system powered by an auxiliary engine, has a separate debris hopper and employs water for dust suppression.
e) The Qualified Inspector shall inspect the site erosion and sediment controls weekly and devote particular attention to all earthwork activities and drainage facilities, keeping them fully operational at all times. Any violation or discrepancies shall be bought to the immediate attention of the Owner and Campus. Maintain a log of all inspections, daily rainfall on-site, corrective actions and maintenance. Submit written inspection logs weekly or as otherwise directed and review site management practices at the periodic meetings.
f) The project has been granted an exemption by the NYS DEC which permits more than 5 acres to be disturbed at one time. The Qualified Inspector shall inspect the site erosion and sediment twice weekly and devote particular attention to all earthwork activities and drainage facilities, keeping them fully operational at all times. Any violation or discrepancies shall be bought to the immediate attention of the Owner and Campus. Maintain a log of all inspections, daily rainfall on-site, corrective actions and maintenance. Submit written inspection logs weekly or as otherwise directed and review site management practices at the periodic meetings.
g) Disturbed areas or stockpiled materials that will not be restored or redistributed within 21 days shall be stabilized within 14 days by use of mulching, seeding, geo-textile fabric or other approved methods.

h) The Contractor shall continue to address sedimentation and erosion control issues related to the Contract through the final acceptance of the Site, at which time the Fund shall file the Notice of Termination to cancel the permit.

i) The Contractor shall reimburse the Fund for all costs associated with regulatory action resulting from the Contractor's failure to comply with the SWPPP.

01 58 13 Project Sign

1. No Contractor identification signage shall be erected or hung from fencing or other construction without the approval of the Fund. Contractor shall provide specific text, size, location, and number of signs for approval of the Fund.
2. The Contractor shall furnish, erect and maintain, at the Site of the work, the exact location thereof to be designated by the Consultant, a construction sign, in the form prescribed by the Contract Documents, containing the title of the Project, the Fund’s name, the names of the Consultant, Contractor and subcontractors engaged in Work on the Project and such other data and information as may elsewhere be prescribed in the Contract Documents.

01 60 00 10 U.S. Steel

1. All structural steel, reinforcing steel, or other major steel items to be incorporated in the Work shall, if this Contract is in excess of $100,000, be produced or made in whole or substantial part in the United States, its territories or possessions. Upon request from the Consultant, provide information from suppliers, fabricators and installers identifying the place of manufacturer and the country of origin for all steel items incorporated into the work.

01 60 00 20 Non-Asbestos Products

1. All materials specified herein shall contain no asbestos.
2. Provide "Contains No Asbestos" permanent labels applied to the exterior jacket of all pipe insulation at 20 foot intervals with a minimum of one (1) label for each service in each Work area.
3. The use of vermiculite in products and systems installed in the Work is acceptable if the product /system manufacturer provides the MSDS sheet showing that no asbestos is present and submits a certification of the origins of the vermiculite showing that it is not from a mine contaminated with asbestos.

01 60 00 30 Products

1. All products shall be new and installed on the project within one year of manufacture, and no recycled, reconditioned, or reused products shall be used unless expressly noted otherwise in the technical specifications.

01 64 00 Campus-Furnished Products

1. The Campus will furnish products from the named manufacturer(s) indicated below that are currently available using New York State Office of General Services (OGS) Procurement Contracts (State Contract) in existence on the day bids are received.

   a) Section (no. and title): All products from the manufacturer named “Mfr name”.
   b) Section (no. and title): All products from the manufacturer named “Mfr name”.
   c) List others.

2. Except for furnishing the products indicated above, the Contractor will be responsible for using, performing, installing, furnishing and supplying of all materials, equipment, skill and labor of every kind, incidentals, and also those things which may be reasonably inferable from the Contract Documents as being necessary or proper for or incidental to the successful completion of the systems into which the products are installed; and the Contractor will be responsible for carrying out of all duties and obligations imposed by the specification sections that include Campus furnished products. The Contractor's responsibilities are same as if Contractor had furnished the products, including providing other products from the named manufacturers that are not currently available on State Contract, which are necessary for the complete installation of the systems specified.

3. The named manufacturer shall review its makes or model numbers and/or other designations listed in its State Contract and it shall allot all the Work required of it in this Contract between its existing State Contract and its subcontract with the Contractor. Whatever the allotment, the named manufacturer acknowledges that it will make its Work complete and operational and in compliance with good practice and it agrees that inadvertent minor discrepancies or omissions shall not be the cause for additional charges or claims.

   a) The Fund, Campus and the Consultant assume no responsibility whatever for this allotment, except that the Campus agrees to purchase the named manufacturer’s products using the State Contract.
   b) The named manufacturer shall provide a list of the products, in the form prescribed by OGS, which the Campus will provide from State Contract.

   c) At the time the Campus furnished products are required for the work, if such products are no longer available on State Contract, the Contractor shall provide comparable products of the named manufacturer and, in such event, the Contract consideration shall be increased by an amount to be determined in accordance with the provisions of Section 4.02 of the Agreement.

4. Employ competent and suitable workers and equipment which meet the quality assurance recommendations and requirements of the named manufacturer and the specifications. Work involving

installation of fire alarm system components shall be performed by a firm currently licensed by the NYS Department of State, Division of Licensing Services. Provide labor and equipment for receiving, unloading, handling, storing, protecting, and installing Campus-furnished products, including making building services connections to Campus networks, system adjustment and calibration, system testing and acceptance, programming related to software and graphics, training of Campus staff, and other services specified.

5. Provide shop drawings, devices counts, field measurement and other submittal information specified. Examine the Work areas and Contract Documents to confirm suitability of products, number and type required and submit detailed list of products, devices and accessories for review. After approval of the list, resubmit it incorporating corrections, if any, requested by the Consultant. Campus will use the list to place the State Contract order. Allow up to 4 weeks for the Campus to finalize the order and 12 weeks for delivery of items in the order in the Time Progress Schedule.

6. Provide accessories, trim, finish, fasteners, and other material needed for a complete installation and indicated use and effect for the products provided by the Campus. Provide construction means, methods, equipment, etc., compatible with products provided by the Campus. If a dispute arises over concurrently selectable but incompatible products, the Consultant will determine which products shall be used.

7. Take delivery, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with the named manufacturer's written instructions.

   a) Schedule delivery with the Campus to minimize long-term storage at Project Site and to prevent overcrowding of construction spaces. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged or sensitive to deterioration, theft, and other losses.

   b) Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected. Store products to allow for inspection and measurement of quantity or counting of units. Store products under cover in a weather-tight enclosure above ground, with ventilation adequate to prevent condensation. Comply with named manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage. Protect stored products from damage and liquids from freezing.

8. Warranties specified shall be in addition to, and run concurrent with, other warranties required by the State Contract.

01 66 00 Equipment Storage and Handling Requirements

1. Store equipment in accordance with the manufacturer’s recommendations, including, but not limited to, providing anti-condensation heaters for electrical or other equipment, or other temporary measures to mitigate impact of environmental conditions in the storage location when such conditions vary from manufacturer recommendations. In addition to the requirements of the technical specifications and Sections 4.13 and 4.14 of the Agreement, for equipment that is stored, delivered and/or installed for Work not yet accepted by the Fund, provide and maintain a preventive maintenance log (Log) that documents maintenance activities performed. (See Sections 4.13 and 4.14 of the Agreement, which requires the Contractor to perform these maintenance activities.)

2. In the Log, list equipment individually. For equipment listed, list the manufacturers’ recommended maintenance activities; recommended maintenance tools, lubricants, parts and other items needed to perform maintenance; recommended frequency for performing maintenance activities; the qualifications

of the workers performing the maintenance activity; anticipated/scheduled dates for performing the maintenance activity; the actual date the maintenance activity was performed; the name of the Contractor's employee who supervised performance and other information requested by the Consultant. See sample layout below:

preventive maintenance log									
Equipment	manufacturers' recommended maintenance activities	maintenance tools, lubricants, parts and other items	frequency of activity	qualifications of the workers	anticipated/ scheduled dates	actual date performed	Name of supervisor	Other	Comments
Item name	Lubicate lubrication points	ISO Grade 32 synthetic lubricant	after each 50 hours of use	Trained in accordance with manufacturer's guidelines	xx/xx/xxxx	xx/xx/xxxx	Mr. Contractor		May need to perform every 25 hours due to jobsite environmental conditions

a. Prior to delivery of equipment to the Site or storage location, submit the Log to the Consultant for approval.
b. After delivery of equipment, upon periodic requests of the Consultant, submit the Log for inspection and review.
c. Prior to acceptance of equipment, submit the Log showing all maintenance activities completed for the equipment proposed for acceptance.
d. Provide timely notification and access for the Consultant and the Fund to witness any preventive maintenance activities listed in the Log.
e. In addition to the above maintenance, where equipment or systems are used during construction for temporary purposes (such as heating, cooling, or other construction uses), provide additional maintenance, cleaning and other activities recommended by the manufacturer for the environmental conditions in which their equipment operates.

01 71 23 Field Engineering

1. In addition to Section 2.24 of the Agreement, employ an independent Land Surveyor (a person not in the regular employment of the Contractor or having any vested interest in the Contractor's business), licensed to practice in the State of New York, for the duration of the Work, to supervise and certify the accuracy of the survey work, including the following:

   a. During the work, submit progress copies for use in Section 01 33 23 20 "Coordination Drawings" and when requested by the Consultant. Upon completion of the Work, submit a certificate signed and sealed by the Land Surveyor, stating that the elevations and locations of the Work are in conformance with the Contract Documents.
   b. Maintain a complete and accurate log of control and survey work as it progresses. Utilize recognized engineering survey practices. Furnish all tools, equipment, and materials required to perform the work.
   c. Verify locations of control points prior to starting work. Control datum for survey is indicated on the Drawings. Confirm permanent survey markers to be used as benchmarks for vertical control on the Site where indicated on the Drawings and referenced to established control points. Record locations, with horizontal and vertical data to within one one-hundredth of a foot, on Project Record Documents.
   d. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means.

2. Survey and record locations of site improvements including utility locations and invert elevations and

a. Power distribution and drainage structures: provide as built inverts at each end of each pipe or conduit.
b. Pipes and conduits ending without structures: provide as built inverts at each end of each pipe or conduit.
c. Structures: as built centerlines and frame elevation.

3. Survey and record locations of building improvements within one week of erection, or as approved by the consultant, including:

a. In all multiple-story construction, the Contractor shall establish and maintain line marks at each floor level and grade marks four (4) feet above the finished floor at each floor level.
b. Grid, perimeter and axis for structures.
c. Building foundation perimeter, column locations, and floor, roof, pit and sump elevations.
    i. Provide as built centerlines and perimeter of columns and piers.
    ii. After the placement of concrete on each level, provide spot elevations on each level on each point of a 10-foot by 10-foot grid starting at the northeast corner of each floor. Show contours at one tenth of a foot where applicable.
    iii. Perimeter of all floor opening locations relative to structural grid.
    iv. After completion of the roofing membrane, provide spot elevations on each level on each point of a 10-foot by 10-foot grid starting at the northeast corner of the building. Show contours at one tenth of a foot where applicable.

d. Inverts of foundation and under drain piping at sumps and cleanouts.

e. For horizontal storm drainage piping suspended below decks, underside elevation spaced at not more than 10 feet on center.

01 71 36 Non-Destructive Building Examination

1. Prior to drilling, coring, cutting or demolishing existing or previously installed substrates, such as concrete and masonry, employ an experienced firm to investigate and locate items concealed in substrates that may be impacted by the work. Locate items such as reinforcing bars, tendons and other structural steel; conduits, piping, ducts and other concealed trade work; voids, substrate thickness and layers; and other concealed conditions within the substrates. Locate by scanning existing substrates with a radar system having a 2.7 GHz antenna (or equivalent system appropriate for the work). As concealed items are discovered and as needed to coordinate with new work, mark out location of such items on the substrate surfaces. Record and save all electronic data acquired during the scanning. If conditions are discovered that differ substantially from those anticipated, provide all electronic data to the Consultant with the notice required by Section 2.12 of the Agreement.

01 73 00 10 Information required for Rebates, Grants, Awards and/or other Programs

1. In addition to Section 4.11 of the Agreement, for the Work listed below, provide invoices, receipts and other documents from suppliers, subcontractors and others to whom the Contractor has allotted any portion of the work. Such invoices, receipts and other documents shall be originals as provided by the suppliers, subcontractors and/or others. In addition, all invoices, receipts and other documents shall have the complete and proper information required for the applicable rebate, grant, award or other program. To avoid withholding of progress payments, submit samples of invoices, receipts and other documents showing the required information and revise samples as directed by the Consultant.
2. Section 01 73 00 10 applies to the following work:

01 73 29 Cutting, Patching and Repairs

1. The Contractor shall do all cutting, fitting, and patching of its Work that may be required to make its several parts come together properly and fitted to receive or be received by work of other Contractors as shown upon or reasonably implied from the Drawings and Specifications for the completed project.

2. Any cost caused by defective or ill-timed Work or service disruption shall be borne by the party responsible therefor. Except as otherwise expressly provided in the Contract Documents, the Contractor shall not cut or alter the work of any other Contractor or existing work without the consent of the Consultant and the Fund.

3. Existing construction finishes, equipment, wiring, etc., that is to remain and which is damaged or defaced by reason of Work done under this Contract shall be restored by the Contractor to a condition satisfactory to the Fund, or replaced with new, at no additional cost.

4. Existing surfaces, materials, and Work shall be prepared as necessary to receive the new installations. Such preparatory work shall be as required by the conditions, and in each case shall be subject to approval by the Consultant and the Fund.

5. Newly exposed work or surfaces which are presently concealed shall be made to match existing corresponding or adjoining new surfaces as directed, and the materials and methods to be employed shall be subject to approval by the Consultant and the Fund.

6. All new, altered, or restored Work in the building and on the Site shall match existing corresponding work in the material, construction finish, etc., unless otherwise specified or required by the drawings.

7. Holes, openings, gaps and voids created by removals shall be filled solid to match existing corresponding or adjoining new surfaces as directed, and the materials and methods to be employed shall be subject to approval by the Consultant and the Fund.

8. Do not cut and patch structural elements in a manner that would reduce their load carrying capacity or load-deflection ratio. Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

9. If possible, retain the original installer or fabricator employed under this Contract to repair, cut and patch exposed Work or, if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm acceptable to the Consultant.

10. Where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required to minimum disturbance of adjacent surface. Temporarily cover openings when not in use. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

11. Where removal of walls or partitions extends one finished area into another: Patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance; Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance. Where patching occurs in a smooth painted surface: extend final paint coat over entire unbroken surface containing the patch, after the patched area has received.

12. Where the extent of patching of portions of the Project is significant and the need for this significant patching is due to the Contractor's means and methods, skill and labor, equipment operations,

sequence of trades, lack of temporary protective facilities and/or other actions during the performance of the work, then the significant patching shall be replaced with new work.

a. The Consultant will determine if patching must be replaced with new work using the following process.

i. Step 1: The Consultant will evaluate the risks associated with the Patching (such as water or water vapor infiltration into the work), the esthetic impact of visible Patching, the impact that Patching has on future maintenance, custodial or other Campus operations and/or other objective criteria that it may deem reasonable during the evaluation of the Patching. Based on this evaluation, the Consultant may recommend moving on to Step 2.

ii. Step 2: The Consultant will count and measure the amount of Patching using the most reasonable unit of measurement applicable. The sum of these counts and measurements will be the total amount of Patching.

1. The Consultant will determine the overall limits (Limits) of the portion of the Project with the Patching. The Limits will include all the Patching counted and measured above plus reasonably adjacent portions of the Project that may be without Patching.
2. The Consultant will measure the Limits using same unit of measurement used to measure the Patching. This quantity will define the extent of the Limits of the portion of the Project with the Patching.
3. Using the figures calculated above, the Consultant determines the number of Patches and the percentage of Patching that exists within the Limits. The Work within Limits shall be replaced with new Work if:
4. If the number count of Patches within the Limits exceeds 2 (two) per 100 (one hundred) square feet (or other appropriate unit of measurement), or
5. If the percentage of Patching exceeds 15% (fifteen percent) within Limits.

b. The Consultant will determine the reasonable extent and type of Work required to replace the Patching and issued detailed drawings and instructions to the Contractor for its use in completing the corrective work.

01 74 00 Clean-Up

1. Periodic Cleaning: The Contractor shall at all times during the progress of the Work keep the Site free from accumulation of waste matter or rubbish and shall confine its apparatus, materials and operations of its workers to limits prescribed by law or by the Contract Limit Lines, except as the latter may be extended with the approval of the Consultant and the Fund. Provide cleaning and waste disposal in accordance with the Fire Code of New York State and as required by NFPA 241 and as recommended in its Annex A, Explanatory Material. Cleaning of the structure(s), once enclosed, must be performed daily and removal of waste matter or rubbish must be performed at least once a week unless more frequent performance is required by NFPA 241 and recommended in its Annex A, Explanatory Material.

a. If open topped dumpsters are within 35 feet of any structure, empty and remove combustible contents from these dumpsters at the end of each shift.

b. Provide periodic pest and vermin control as required to deliver the completed building completely free of any infestation.

c. Waste Disposal: Do not dispose of, bury, or burn waste materials on-Site. Grinding of concrete, asphalt or masonry for disposal shall not occur on-Site. Do not wash waste materials down sewers or into waterways.

d. Demolition and removal Work on Site shall be limited to the minimum work required to create debris that allows for reasonable handling and transport. Additional work on debris, such as grinding, cutting or crushing, which may be desired by the Contractor to make the material ready for reuse off-site, shall be performed off-site.

e. Prior to installation of ceilings, inspect all above ceiling areas and leave the completed above ceiling work and areas without the need of further cleaning of any kind and with all Work in new condition and perfect order.

f. In addition to and in coordination with testing and cleaning specified in Divisions 2 through 48 inclusive, periodically flush and clean air and fluid new and existing systems in portions (sections) as the Work is installed. Flushing and cleaning of existing systems is limited to portion modified in this Work and portions shut down by this project (dead legs), where such portions were left without flow. Such dead legs shall be flushed and cleaned prior to restoration of use.
    i. Submit a flushing and cleaning plan to the Consultant for approval prior to beginning installation of a system.
    ii. Unless otherwise approved by the Consultant, select portions of systems for cleaning in a manner that limits the maximum size of a portion cleaned in a single effort to an individual riser, to individual floor system and to not more than 1,000 linear feet in length of the installed portion of a riser or individual floor system, whichever is less.
    iii. Where portions of systems are excluded from the portions being cleaned, provide all additional Work required to functionally extend systems around the excluded and/or uncompleted portions and to fully separate the portions being cleaned from the excluded and/or uncompleted portions.
    iv. Unless otherwise approved by the Consultant, fully separate fixtures, appliances, and equipment from the portions being cleaned by providing all additional Work required to functionally extend systems around the excluded fixtures, appliances, and equipment and to fully separate the portions being cleaned from the excluded fixtures, appliances, and equipment.
    v. Provide temporary means for providing and moving air and/or fluid at the rate required to flush and clean the portions of systems being cleaned unless use of permanent equipment is specifically approved by the consultant. If the permanent equipment is permitted to be used, provide a letter from the manufacturer's technical representative agreeing to such use, stating that its use shall not limit their warranty and excluding the time their system is used from the project specific warranty period. See 01 78 36, Warranties, for additional requirements.
    vi. Capture, treat and legally dispose of air and fluid discharges, effluent and any materials cleaned from a systems or portions of a system. When approved by the consultant, the Campus sanitary system may be used to convey discharges if the local treatment facility provides written confirmation to the Contractor that it will accept such discharges.

2. In addition, during the course of the work, the Contractor shall remove dust, debris, rubbish, and other materials scattered and dispersed from its Work area into other spaces, sites, equipment or materials owned or controlled by others. Engage qualified firms and competent workers to restore the use or appearance of such spaces, sites, equipment or materials to their original condition and to the satisfaction their owner or controller. If such scattering or dispersal occurs,

provide qualified workers during all periods of subsequent Work to provide daily monitoring, containment, continuous cleaning, and other actions or modifications to work activities as required to mitigate future scattering or dispersal.

a. Provide and maintain sweeping compound to assist in daily cleanup as needed for the duration of the project. Provide, maintain and replace as necessary general use construction push brooms (soft bristle), construction push brooms (course bristle), heavy-duty, flat edge shovels and dustpans.

3. Final Clean Up: Upon completion of the Work covered by the Contract, the Contractor shall leave the completed project ready for use without the need of further cleaning of any kind and with all Work in new condition and perfect order. At least two weeks prior to the start of Final Clean Up, submit a written implementation plan describing cleaning methods, staff, sequence and schedule of activities and other information requested by the Consultant. In addition, upon completion of all work, the Contractor shall remove from the vicinity of the Work and from the property owned or occupied by the State of New York, the State University of New York or the Fund, all plant, buildings, rubbish, unused materials, concrete forms and other materials belonging to it or used under its direction during construction or impairing the use or appearance of the property and shall restore such areas affected by the Work to their original condition, and, in the event of its failure to do so, the same shall be removed by the Fund at the expense of the Contractor, and it and its surety shall be liable therefor.

01 74 16 Payment for Planting Maintenance

Not applicable

01 74 19 Construction Waste Management

In addition to the requirements of the above Sections 01 35 13, Conducting Work, and 01 74 00, Clean Up, implement a construction and demolition (C&D) waste management plan which recycles at least 50% of the non-hazardous building C&D waste generated.

a. In conjunction with monthly payment applications, submit a waste management reporting form for all materials transferred from the project site for recycling or disposal. Reporting form shall:
    i. Include receipts or other documentation from the disposal and/or recycling facility of the quantity and type of materials transferred.
    ii. Provide the name and address of the disposal facilities and/or recycling facilities where materials will be disposed or recycled.
    iii. Report all the material quantities either by weight or volume. To convert volume into weight use the US EPA conversion rates.
    iv. Provide documentation for materials or equipment to be removed from the site for sale or reuse, or turned over to the Campus, which are classified as recycled materials. Documentation shall include the description of the materials or equipment, weight or quantity of materials or equipment, and a receipt for the sale, a letter on Contractor's letterhead indicating the reuse or the Campus' signed receipt of materials or equipment, and the applicable fee(s) paid or payment(s) received.
    v. Show the percentage of recycling achieved to date.
b. Within 30 days after Substantial Completion, submit the total quantities for all C&D and the percentage of materials which were recycled.
c. Any money received by the Contractor for materials recycled, sold or reused off site was considered when the Bid Proposal submitted to the Fund and may be retained by the Contractor. The Contractor is solely responsible for the security of any materials that may be recycled, sold, or reused.

2. For all construction and demolition waste that leaves Campus with a manifest, provide copies of manifests in the monthly reports. For each manifest that requires the Campus EPA ID number as the generator of the waste, submit a draft copy for the review by the Campus, make any reasonable corrections that the Campus requests, and allow one week for the Campus to review and sign each completed manifest.

01 75 10 Consumables used during the Work.

Except for energy, fuel, and/or water specified as provided by the Campus, provide all consumable parts, fluids, gases, materials, products, energy, and fuel(s) required for transporting, assembling, erecting, installing, start-up and commissioning, and testing of the materials prior to Substantial Completion, including consumable supplies normally consumed in the assembly, erection, installation, start-up and commissioning, and testing, and maintenance of the Work until Substantial Completion of the Project. Such consumable parts shall not include any spare parts, attic stock, or any consumable parts specified in Divisions 1 through 48, inclusive, for turnover to the Campus.

01 78 23 Operations and Maintenance Manuals (O&M's)

1. O&M's Submissions
   a. The O&M's applicable to this Contract must be substantially completed before the Project can be used for the purpose for which it was intended.
   b. In accordance with the approved submittal schedule in Section 01 32 16 Project Schedule, provide the applicable O&M's as required per the Submittal sections of the Technical Specifications for review, concurrent with all other required submittals.
   c. Assemble and submit final O&M's prior to requesting inspection for Substantial Completion and at least 45 days before the training detailed in section 01 79 00 Training of Campus Personnel and the applicable Technical Specifications. Consultant and Commissioning Authority (CxA) will provide comments on the final O&M's within 15 days of receipt.
      i. Correct or revise each manual to comply with Consultants and CxA's comments. Submit copies of each corrected O&M's within 15 days of receipt of the Consultant's and CxA's comments and at least 15 days prior to commencing training detailed in section 01 79 00 Training of Campus Personal and the applicable Technical Specifications.
   d. Unless otherwise approved by the Fund, in the Contract Breakdown required by Section 4.08 of the Agreement, the scheduled value of Contractor provided O&M's shall be 5% of the estimated value for the Work covered in the O&M's

The Contractor shall furnish two (2) complete bound paper copies and PDF/A files of O&M's for all systems, subsystems, and pieces of equipment involved in the Contract. O&M's include definite and specific instructions on the proper operation and maintenance of the systems. The requirements of this section are in addition to the requirements of Section 01 33 23 Shop Drawings and Samples.

   b. PDF/A copies shall be stored and labeled on four (4) sets of archival optical discs, Universal Serial Bus (USB) flash drives or other electronic data storage devices approved by the Consultant. All documents shall be indexed, text searchable, navigable format. PDFs created by scanning are not acceptable unless all images of text are properly and completely transformed into the electronic characters representing the text.
   e. Final copies shall be complete except for copies of original warranties and other items approved by the Consultant for turnover on the date of Substantial Completion.

2. General requirements for O&M's:
    a. Organization: Organize the O&M's into separate volumes/sections by CSI number based on the table of contents of the Project Manual, for each system and subsystem, and a separate section for each piece of equipment not part of a system. Arrange content within volumes/sections alphabetically. Each volume shall contain the following materials, in the order listed:
        i. Title Page.
        ii. Table of Contents.
        iii. Volume Contents:
            1. Operation Data.
            2. Product Maintenance Data.
            3. Systems and Equipment Data.
    b. Title Page: Include the following information:
        i. Subject matter included in volume
        ii. Name and address of Project and Owner
        iii. Date of submittal
        iv. Name and contact information for:
            1. Contractor and Major Subcontractors.
            2. Construction Manager.
            3. Consultant and Major Subconsultant.
            4. Commissioning Agent.
            5. Cross-references to related system in other O&M's
    c. Table of Contents: List each product included in O&M's, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
        i. If O&M's documentation requires more than one volume to accommodate data, include a comprehensive table of contents for all volumes in each volume of the set.
    d. Volume Contents: Organize into sets of manageable size. Arrange contents alphabetically by CSI number, system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single volume.
    e. Manufacturers' Data: Where O&M's contains manufacturers' standard printed data: include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data includes more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
        i. Prepare supplementary customized narrative text if manufacturers' standard printed data are not available or where project specific information is necessary for proper operation and maintenance of equipment or systems.
    f. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of standard component parts of equipment and systems and to illustrate actual control sequences and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.
        i. Do not bind as part of O&M's the Record Drawings provided in accordance with Section 2.24 of the Agreement.
    g. When multiple binders are required, use the same type and size of binder for each volume
    h. Internally subdivide the binder contents with permanent page dividers, logically organized as described below, with tab titles clearly printed under reinforced laminated plastic tabs:

i. Use 8-1/2 x 11-inch text pages bound in spring post binders with durable plastic covers and sides identified with printed titles “OPERATION AND MAINTENANCE MANUALS”, title of project, and subject matter of binder. 11 x 17 paper may be used if each page is folded three times to fit the 8-1/2 x 11 format

3. Operation Data
    a. Content: Organize Operation Data into a separate section, within the O&M’s.
    b. Engage a manufacturer authorized service representative(s) to provide and prepare the information.
    c. Prepare a separate section indicating operation of each system and subsystem, and piece of equipment not part of a system in the form of an instructional manual for use by operating personnel.
    d. In addition to requirements in this section include operation data as required in the Technical Specification sections.
        i. System, subsystem, and equipment descriptions. Use designations for systems, subsystems and equipment indicated on Contract Documents.
        ii. Operating standards.
        iii. Operating procedures.
        iv. Operating logs.
        v. Wiring diagrams, as installed.
        vi. Control diagrams, as installed. Describe the sequence of operation, and diagram controls as/where required for identification.
        vii. Piped system diagrams, as installed and identify color-coding as installed.
        viii. Precautions against improper use.
        ix. License requirements, if any, including inspection and renewal dates.
    e. Description of system, subsystem, or equipment, as applicable, including:
        i. Product name and model number. Use designations for products indicated on Contract Documents.
        ii. Manufacturer's name.
        iii. Equipment identification with serial number of each component.
        iv. Equipment function.
        v. Operating characteristics.
        vi. Limiting conditions.
        vii. Performance curves.
        viii. Engineering data and tests.
        ix. Complete nomenclature and number of replacement parts.
    f. Operating instructions and procedures, including:
        i. Startup procedures.
        ii. Equipment or system break-in procedures.
        iii. Routine and normal operating instructions.
        iv. Regulation and control procedures.
        v. Instructions on stopping.
        vi. Normal shutdown instructions.
        vii. Seasonal and weekend operating instructions.
        viii. Required sequences for electric or electronic systems.
        ix. Special operating instructions and procedures.

4. Product Maintenance Data
    a. Content: Organize Product Maintenance Data into separate section, within the O&M’s, for each product, material, and finish. Include source information, product information,

maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

b. Source Information: List each product included in section identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross reference specification section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

c. Product Information: Include the following, as applicable:
    i. Product name and model number.
    ii. Manufacturer's name.
    iii. Color, pattern, and texture.
    iv. Material and chemical composition.
    v. Reordering information for specially manufactured products

d. Maintenance Procedures: Include manufacturer's written recommendations and the following:
    i. Inspection procedures.
    ii. Types of cleaning agents to be used and methods of cleaning.
    iii. List of cleaning agents and methods of cleaning detrimental to product.
    iv. Schedule for routine cleaning and maintenance.
    v. Repair instructions.

e. Repair Materials and Sources: Include a list of materials and local sources of materials and related services.

f. Warranties and Guarantees: Include copies of warranties and guarantees lists of circumstances and conditions that would affect validity of warranties.
    i. Include procedures to follow and required notifications for warranty claims.

5. Systems and Equipment Maintenance Data

a. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers maintenance and documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

b. Source Information: List each system, subsystem, and piece of equipment included in a separate section within the O&M's identified by product name, and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

c. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
    i. Standard maintenance and repair instructions and bulletins.
    ii. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
    iii. Identification and nomenclature of parts and components.
    iv. List of items recommended to be stocked as spare parts with parts identified and cross-referenced to manufacturers' maintenance documentation.

d. Maintenance procedures: Include the following information and items that detail essential maintenance procedures:
    i. Test and inspection instructions.
    ii. Troubleshooting guide.
    iii. Precautions against improper maintenance.

iv. Disassembly; component removal, repair, and replacement; and reassembly instructions.
v. Aligning, adjusting, and checking instructions.
vi. Demonstration and training video recording, if specified.

e. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
   i. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
   ii. Maintenance and Service Record: Include manufacturers' forms for recording maintenance and inspection.

f. Spare parts list and source information: Include list of replacement repair parts, with parts identified and cross referenced to manufacturers' maintenance documentation and local sources and maintenance materials and related services.

g. Warranties: Include copies of warranties and list of circumstances and conditions that would affect validity of warranties.
   i. Include procedures to follow and required notifications for warranty claims.

01 78 36 Warranties

1. In addition to the requirements of Section 2.25 of the Agreement, provide warranties for products, equipment, systems and installations required by other technical sections of Contract Documents for duration indicated. Warranties shall be individually listed in the project specific submittal log required by 01 33 23, Shop Drawings and Samples.

   a. All warranties required by Contract Documents shall commence on date / time of Substantial Completion shown on Page A-1 of the Agreement.

      i. At no additional cost to the Fund, for products, equipment, systems and installations completed prior to the date of Substantial Completion, obtain and pay for warranty extensions that cover the additional time between the earlier date of their completion and the date of Substantial Completion.

   b. Provide a list of all Contractor provided warranties that are specified in Divisions 1 through 48, inclusive, and list who will inspect the Work covered by the warranty (if applicable), when it will be done, who witnessed it and when, results (pass/fail), follow up action, comments and other information requested by the Consultant.

      i. Unless otherwise approved by the Fund, all inspections must be witnessed and signed off by the Consultant prior to acceptance of Contractor provided warranties that are specified in Divisions 1 through 48, inclusive.

      ii. The Consultant will reject a Warranty issued prior to or without the manufacturer's field inspection of the work, if required in Divisions 1 through 48, inclusive.

   c. Unless otherwise approved by the Consultant and if required in Divisions 1 through 48, inclusive, the scheduled value of a Contractor provided warranty in the Contract Breakdown required by Section 4.08 of the Agreement shall be 5% of the amount estimated for the Work being warrantied.

Furnish and organize original warranties in a separate binder with a durable plastic cover. Organize the binder into separate sections by CSI number based on the table of contents of the project manual. Internally subdivide the binder contents with permanent page dividers, logically organized as described below, with tab titles clearly printed under reinforced laminated plastic tabs. Provide a printed Table of Contents.

Warranties shall be in the form required by the applicable technical sections of Contract Documents. Include procedures to follow and required notifications for warranty claims.

i. Warranty Certification: Written certification from the warrantor that the warranty is in effect and non-retractable due to any of the specified conditions. Warranties submitted without warranty certification will not be accepted.

ii. Deliver the binder to the Consultant with the written notice of Substantial Completion required by Section 2.23(2) of the Agreement.

d. For uncompleted Work delayed beyond date of Substantial Completion, provide updated binder submittal within 10 days after acceptance, indicating date of acceptance as start of warranty period for any Work delayed beyond date of Substantial Completion.

2. Applications for payment after the date of Substantial Completion may not be approved until the warranty certification and warranty documents are delivered to the Consultant.

01 78 39 Project Record Documents

1. In addition to Section 2.24 of the Agreement, provide the Records Information required by Fire Code part 901.6.3.1 and the Operating Adjustments and Instructions required by Mechanical Code part 1004.7.

01 79 00 Training of Campus Personnel

1. Training of Campus personnel in the use of the Work of this Project must be substantially completed before the Project can be used for the purpose for which it was intended. The information required by Section 01 78 23 Operating Instructions and Manuals is required for training to occur and be completed.

2. The Contractor shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed. A draft schedule of all training shall be submitted three months prior to any training and finalized one month prior to the actual training. In addition to these general requirements, additional specific training requirements of Campus personnel by the Contractor are specified in other the applicable specifications. The Campus will designate the personnel who will be trained, and some personnel may not be direct employees of the Campus.

3. The Contractor shall provide individual training sessions for each piece of equipment furnished under this Contract. The Contractor shall provide factory authorized representatives for each training session. Training shall include operation and maintenance, preventative maintenance and troubleshooting. Operation and maintenance manuals shall be furnished to the Campus personnel three weeks prior to the associated training session.

a. The Contractor shall schedule all training sessions. A minimum of 48-hour notice is required for scheduling. Training for each piece of equipment shall be provided in two separate sessions for each shift, one week apart. Each training session shall be no less than four hours in duration (total of 8 hours training per shift for each piece of equipment).

b. The Contractor shall provide an additional four-hour refresher training session. The refresher training shall be provided three months after the respective equipment has been accepted.

4. The Consultant shall review and approve an outline of the content and adequacy of the training of Campus personnel for the equipment. The outline will be reviewed for content to ensure adequate coverage of the material. The Contractor will be required to revise the outline and training session based on comments by the Consultant. After approval of the training outline, submit draft PowerPoints (or equivalent) for the training. These project-specific PowerPoint presentations will integrate photos of as-built conditions, images of project specific diagrams and project specific visual cues for applicable systems. The Campus shall be responsible for providing the appropriate personnel at each session. Sessions once held may not be repeated, unless deficient or improperly taped, without additional cost to the Contractor. Contractor shall assign a person other than the training session instructor to operate the videotaping equipment. Tape of the first session shall be reviewed immediately with the Consultant to confirm that the taping method provides suitable, clear documentation of the training session, and shall become the sample against which all future tapes are judged. Tapes with substantial deficiencies, as compared to that sample, shall be redone in a repeated session of training. Tapes shall be copied for insertion into each manual and shall be indexed and titled as to their contents with type written labels. The Campus personnel in attendance shall be documented with a sign in sheet for each session, to be included in the O & M Manuals. Attendance sign-in shall constitute their certification that full training in the subjects was covered. Where training occurs off Campus, provide confirmation vouchers showing attendance paid in full.

5. Refer to technical specification sections for additional training.

****End of 01 00 00 General Requirements***

PROJECT No. 081506-00

Contractor Job #:

Project Name: Renovate Peregrine Dining Hall, Bldg. No. 032
Revised By:
DATE: 08/17/27

Status Key: **NYS** - Not Yet Submitted **SCH** Scheduled for submission **SUB** - Submitted & Recieved **APP**-Approved No Exceptions Taken **MCN**- Make Corrections Noted **R&R**- Revise & Resubmit **REJ**- Rejected **SSI**- Submit Specified Item **RFR** - Resubmit for Record Only
Submittal Type Key: **SD** - Shop Drawing **DAT** - Project / Product Data **SAM** - Sample **CAL** - Calculations **TEST** - Test report **WAR** - Warranty **CERT** - Certification **QC** - Quality Control / Qualifications submittal **EXT** Extra Stock / tool **OMM** - Operations Maintenance Manual **REP** Report **OTH** - descr in comments

For Bidding, Printing columns to the left of "Description / Subject of Submittal" is optional

line No.	Contractor ID No.	CSI Section No.	Paragraph No.	Revision / Version No. (if appl.)	Description / subject of Submittal	Submittal Action Category	Submittal Type	Status	Firm preparing Submittal	Firm Reviewing Submittal	Proposed Submission Date	Actual Submission Date	Requested Approval Date	Actual Approval Date	Date Submission Returned	Purchasing Date	Fabrication Date	Installation Date	1st Delivery Inspected Date	Pre Install. Conf. Date	Mock up inspected Date	Other (desc.)	Comments
1		00 52 00	Section 2.18		List of Subcontractors	Action	DAT	NYS															Due prior to work and not later than 30 days after NTP
2		00 52 00	Section 2.12		Site Conditions	Informational	REP	NYS															if needed
3		00 52 00	A-Sec 2.24(3)		Record Drawings	Informational	OTH	NYS															
4		00 52 00	A-Sec 3.06		Monthly Reports	Informational	REP	NYS															
5		00 52 00	A-Sec 4.08		Schedule of Values	Action	OTH	NYS															
6		00 52 00	A-Sec 6.07-1		MBE/WBE Monthly Utilization Reports (online only)	Informational	REP	NYS															
7		00 52 00	A-Sec 2.06		Superintendent Submission	Action	OTH	NYS															
8		01 18 13			Utility Shutdown Schedule	Action	OTH	NYS															
9		01 26 13			Request for Information (RFI) log	Action	OTH	NYS															
10		01 29 00 10			Meter readings	Informational	DAT	NYS															monthly
12		01 31 13 10			Existing Conditions reports	Informational	REP	NYS															if needed
11		01 31 19			bi-weekly reports	Informational	REP	NYS															
13		01 32 13 10			Off campus street access	Informational	REP	NYS															if needed
14		01 32 16			Project Schedule and Submittal Schedule	Action	OTH	NYS															
15		01 32 33			Project Photographs	Informational	REP	NYS															Due prior to work
16		01 33 23			Submittal management website	Action	OTH	NYS															if needed
17		01 33 23			Archival submittals	Informational	OTH																if needed
18		01 33 23 10			Coordination Drawings	Action	SD	NYS															Due prior to work
19		01 33 29			Sustainable Design Reporting																		
20		01 35 13			emergency action plan	Informational	DAT	NYS															
21		01 35 13			daily reports	Informational	REP	NYS															Due before waste leaves site
26		01 35 13			ID Badge Format	Informational	OTH	NYS															
27		01 35 13			daily manpower counts	Informational	REP	NYS															
28		01 35 23			Safety Procedures Manual	Informational	DAT	NYS															
29		01 35 23			Names of "competent" persons	Informational	DAT	NYS															
30		01 35 23			Pre-Demolition utility plan	Informational	SD	NYS															
31		01 35 23			Approved Confined Space Permits																		
32		01 35 23			Temporary Egress / Barrier Plan	Informational	OTH	NYS															
33		01 35 23 10			MSDS sheets	Informational	DAT	NYS															if needed
34		01 41 13			Special Inspection submissions	Action	TEST	NYS															
35		01 41 13			Fire Alarm System License	Informational	OTH	NYS															
36		01 41 13			Code test and inspection forms	Action	REP	NYS															
37		01 41 13			Name of Commissioning contact	Action	REP	NYS															
24		01 41 16			Diesel vehicle forms	Informational	DAT	NYS															if needed
39		01 41 16			Cooling tower maintenance plan	Action	REP	NYS															
38		01 51 16			Fire watch plan	Action	REP	NYS															
40		01 52 13			Field Office equipment information	Action	REP	NYS															
41		01 54 13			Plan for Use of Elevator(s) for Construction	Action	REP	NYS															
25		01 55 26			Temporary Traffic Control plans	Action	SD	NYS															
42		01 55 29			lifting procedure safety plan	Informational	DAT	NYS															if needed
43		01 55 29			Petolium Spill Compliance Certification	Informational	OTH	NYS															
22		01 57 23			SWPPP modifications	Informational	DAT	NYS															
23		01 57 23			SWPPP inspection logs	Informational	DAT	NYS															
44		01 60 00 20			Vermiculite origins certification	Informational	OTH	NYS															
45		01 64 00			Campus-Furnished Products submittals	Action	SD	NYS															if needed
46		01 66 00			Preventive maintenance log	Action	REP	NYS															
47		01 71 23			Field Engineering surveys	Informational	DAT	NYS															
48		01 73 00 10			Information for Rebates/Grants/Awards/Programs	Informational	DAT	NYS															
49		01 74 00			Fluid system flushing and Clean Up plan	Informational	DAT	NYS															
50		01 74 00			Final Cleanup Plan	Informational	DAT	NYS															
51		01 74 16			Planting Maintenance logs	Informational	DAT	NYS															
52		01 74 19			Construction Waste Management Plan	Action	OTH	NYS															
53		01 74 19			Construction Waste manifests/monthly reports	Action	OTH	NYS															
54		01 78 23			Operating Instructions and Manuals	Action	OTH	NYS															
55		01 78 36			Warranties	Action	OTH	NYS															
56		01 79 00			Schedule of Campus training	Action	OTH	NYS															
57		01 79 00			Outlines of actual training	Action	OTH	NYS															
58		03 20 00			Rebar	Action	SD	NYS															
59		03 30 00			Cast In Place Conc.	Action	DAT	NYS															
60		03 35 10			Concrete Floor Finish	Action	DAT	NYS															
61		03 45 00			Precast Architectural Concrete	Action		NYS															
62		04 21 29			Terra Cotta Masonry	Action	SD	NYS															
63		04 22 00			Concrete Masonry Unit	Action	DAT	NYS															
64		05 12 00			Structural Steel	Action		NYS															

PROJECT No. 081506-00

Contractor Job #:

Project Name: Renovate Peregrine Dining Hall, Bldg. No. 032
Revised By:
DATE: 08/17/27

Status Key: **NYS** - Not Yet Submitted **SCH** Scheduled for submission **SUB** - Submitted & Recieved **APP**-Approved No Exceptions Taken **MCN**- Make Corrections Noted **R&R**- Revise & Resubmit **REJ**- Rejected **SSI**- Submit Specified Item **RFR** - Resubmit for Record Only
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line No.	Contractor ID No.	CSI Section No.	Paragraph No.	Revision / Version No. (if appl.)	Description / subject of Submittal	Submittal Action Category	Submittal Type	Status	Firm preparing Submittal	Firm Reviewing Submittal	Proposed Submission Date	Actual Submission Date	Requested Approval Date	Actual Approval Date	Date Submission Returned	Purchasing Date	Fabrication Date	Installation Date	1st Delivery Inspected Date	Pre Install. Conf. Date	Mock up inspected Date	Other (desc.)	Comments
65		05 40 00			Cold Form Metal Framing	Action		NYS															
66		05 52 13			Pipe and Tube Railings	Action		NYS															
67		05 58 13			Column Covers	Action		NYS															
68		06 16 00			Sheathing	Action		NYS															
69		07 13 26			Self Adhereing Sheet Waterproofing	Action		NYS															
70		07 21 00			Thermal Insulation	Action		NYS															
71		07 54 23			Thermoplastic Polyolefin	Action		NYS															
72		07 62 00			Sheet Metal Flashing and Specialites	Action	DAT	NYS															
73		07 72 00			Roof Accessories	Action	DAT	NYS															
74		07 81 23			Intumescent Fire Resistive Materials	Action	DAT	NYS															
75		07 84 13			Penetration Stopping	Action	DAT	NYS															
76		07 92 00			Joint Sealants	Action	DAT	NYS															
77		07 95 00			Expansion Control	Action	DAT	NYS															
78		08 11 13			Hollow Metal Doors and Frames	Action	SD	NYS															
79		08 14 16			Flush Wood Doors	Action	SD	NYS															
80		08 41 13			Aluminum Entrances and Storefronts	Action	SD	NYS															
81		08 71 00			Door hardware	Action	DAT	NYS															
82		08 80 00			Glazing	Action	SD	NYS															
83		09 21 16			Gypsum Board Shaft Wall Assemblies	Action	DAT	NYS															
84		09 22 16			Non Structural Framing	Action	SD	NYS															
85		09 29 00			Gypsum Board	Action	DAT	NYS															
86		09 30 13			Ceramic Tile	Action	DAT	NYS															
87		09 51 23			Acoustical Tile Ceilings	Action	DAT	NYS															
88		09 65 13			Resilient Base and Accessories	Action	DAT	NYS															
89		09 67 23			Resinous Flooring	Action	DAT	NYS															
90		09 68 13			Tile Carpeting	Action	DAT	NYS															
91		09 91 00			Painting	Action	DAT	NYS															
92		09 93 00			Staining and Transparent Finishes	Action	DAT	NYS															
93		10 11 00			Visual Display Surfaces	Action	SD	NYS															
94		10 14 00			Interior Signage	Action	SD	NYS															
95		10 44 13			Fire Extinguisher Cabinets	Action	DAT	NYS															
96		10 44 16			Fire Extinguisher	Action	DAT	NYS															
97		12 24 13			Roller Window Shades	Action	SD	NYS															
98		12 36 61			Solid Surfacing Countertops	Action	SD	NYS															
99		14 21 00			Electric Traction Elevator	Action	SD	NYS															
100		21 05 24			Backflow Preventers	Action	DAT	NYS															
101		21 05 29			Pipe Hangers and Supports	Action	DAT	NYS															
102		21 13 00			Sprinkler Piping	Action	DAT	NYS															
103		22 05 23			General Duty Valves for Plumbing Piping	Action	DAT	NYS															
104		22 05 29			Hangers and Supports for Plumbing Piping & Equip.	Action	DAT	NYS															
105		22 05 48.13			Vibration Controls for Plumbing Piping & Equip.	Action	DAT	NYS															
106		22 05 93			Test, Adjusting and Balancing for Plumbing	Action	DAT	NYS															
107		22 07 19			Plumbing Piping Insultation	Action	DAT	NYS															
108		22 11 16			Domestic Water Piping	Action	DAT	NYS															
109		22 11 23.21			Inline, Domestic - Water Pumps	Action	DAT	NYS															
110		22 13 16			Sanitary Waste and Vent Piping	Action	DAT	NYS															
111		22 13 19			Sanitary Waste Piping Specialties	Action	DAT	NYS															
112		22 13 19.13			Sanitary Drains	Action	DAT	NYS															
113		22 14 14			Storm Drainage Piping	Action	DAT	NYS															
114		22 14 23			Storm Piping Specialties	Action	DAT	NYS															
115		22 14 29			Sump Pumps	Action	DAT	NYS															
116		22 47 00			Drinking Fountains and Water Coolers	Action	DAT	NYS															
119		23 05 16			Expansion Fittings and Loops for HVAC Piping	Action	DAT	NYS															
120		23 05 17			Sleeves and Sleeve Selas for HVAC Piping	Action	DAT	NYS															
121		23 05 18			Escutcheons	Action	DAT	NYS															
122		23 05 18			Meters and Gauges for HVAC Piping	Action	DAT	NYS															
123		23 05 93			Testing, Adjusting and Balancing for HVAC	Action	DAT	NYS															
124		23 07 00			HVAC Insultaion	Action	DAT	NYS															
125		23 07 13			Duct Insulation	Action	DAT	NYS															
126		23 07 19			HVAC Piping Insulation	Action	DAT	NYS															
127		23 21 13.33			Ground Loop Heat Pump Piping	Action	DAT	NYS															
128		23 21 23			Hydronic Pumps	Action	DAT	NYS															
129		23 33 00			Air Duct Accessories	Action	DAT	NYS															
130		23 36 00			Air terminal accessories	Action	DAT	NYS															
131		23 37 13			Diffusers, Reigters and Grills	Action	DAT	NYS															
132		23 72 00			Air to Air Recovery Equipment	Action	DAT	NYS															
133		23 73 13			Modular Indoor Central Station Air Handoling Units	Action	DAT	NYS															
134		23 82 33			Convectors	Action	DAT	NYS															
135		26 05 13			Medium Voltage Cables	Action	DAT	NYS															
136		26 05 29			Hangers and Supports for Electrical Systems	Action	DAT	NYS															
137		26 05 33.13			Conduits for Electrical Systems	Action	DAT	NYS															

PROJECT No. 081506-00

Contractor Job #:

Project Name: Renovate Peregrine Dining Hall, Bldg. No. 032
Revised By:
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138		26 05 33.16			Boxes and Covers for Electrical Systems	Action	DAT	NYS															
139		26 05 33.23			Surface raceways and Electrical Systems	Action	DAT	NYS															
140		26 05 43			Underground Ducts and Raceway for Elec. Systems	Action	DAT	NYS															
141		26 05 44			Sleeves/Sleeves Seals for Elec. Raceways & Cabling	Action	DAT	NYS															
142		26 09 23			Lighting Control Devices	Action	DAT	NYS															
143		26 11 16			Secondary Unit Substation with Switchboard Sec.	Action	DAT	NYS															
144		26 22 00			Low Voltage Transformers	Action	DAT	NYS															
145		26 27 16			Electrical Cabinets and Enclosures	Action	DAT	NYS															
146		26 27 26			Wiring Devices	Action	DAT	NYS															
147		26 28 13			Fuses	Action	DAT	NYS															
148		26 28 16			Enclosed Switches and Circuit Breakers	Action	DAT	NYS															
149		26 32 13			Engine Generators	Action	DAT	NYS															
150		26 36 00			Transfer Switches	Action	DAT	NYS															
151		26 43 13			Surge Protection for Low Volt Elec. Pwr Cir.	Action	DAT	NYS															
152		26 51 00			Interior Lighting	Action	DAT	NYS															
153		26 51 60			LED Lighting Fixtures	Action	DAT	NYS															
154		26 56 00			LED Exterior Lighting Fixtures	Action	DAT	NYS															
155		27 10 00			Data Communications	Action	DAT	NYS															
156		28 14 00			Access Control System Hardware	Action	DAT	NYS															
157		28 15 00			Integrated Access Control Hardware Devices	Action	DAT	NYS															
158		28 15 15			Electrified Locking Devices and Accessories	Action	DAT	NYS															
159		28 15 19			Access Control Remote Devices	Action	DAT	NYS															
160		28 47 00			Mass Notification	Action	DAT	NYS															
161		28 46 00			Addressable FA System	Action	DAT	NYS															
162		**Consultant adds submittals listed in Technical specs after the above**																					
163		**Consultant should also adjust print area to only include rows with text**																					

Weekly Fire Code Review

SUNY State University Construction Fund

SUCF Project No. ☐

Contractor: ☐ Firm ID: ☐

Location(s): ☐

Contractor Fire Prevention Program Superintendent: ☐

Campus Fire Prevention Program Manager: ☐

Code Enforcement Official (CEO): ☐

#	*All bracketed references are from* **NFPA 241,** *Standard for Safeguarding Construction, Alteration, and Demolition Operations, unless otherwise noted. This is not a complete list of requirements.*	YES	NO	N/A
1	**Temporary Separation Walls** {8.6.2}: Is there adequate separation between the work area and the rest of the building (One hour separation walls and 45 min opening protectives are often required by 8.6.2)?	☐	☐	☐
2	**Temporary Enclosures** {4.3.1}: Are all panels, tarps, plastic sheeting, etc. flame retardant?	☐	☐	☐
3	**Impairments** {IFC Section 1003}:			
	☐ Have paths of egress from occupied areas been maintained? {IFC Section 1003}:	☐	☐	☐
	☐ If fire alarm/detection systems in occupied areas have been temporarily impaired. Has the Campus Fire Prevention Program Manager approved the impairments/restrictions? {IFC Section 901}	☐	☐	☐
4	**Fire Extinguishers** {4.3.4}:			
	☐ Are appropriate fire extinguishers readily available, with a maximum travel distance of 50 feet?	☐	☐	☐
	☐ Have fire extinguishers been provided within temporary enclosures?	☐	☐	☐
5	**Internal Combustion Devices** {4.4}:			
	☐ Are all internal combustion devices, where required, exhausted outside, with a least 9 inches between exhaust and combustible materials?	☐	☐	☐
	☐ Is refueling only done on cool engines?	☐	☐	☐
6	**Temporary Heating** {5.2}: Is temporary heating equipment listed and being used according to the manufacturer's requirements?	☐	☐	☐
7	**Hot Work Programs** {5.1}:			
	☐ Is there a current permit for ongoing operations?	☐	☐	☐
	☐ Are all precautions required by the permit in place?	☐	☐	☐
	☐ Is there a dedicated fire watch?	☐	☐	☐
	☐ Does the fire watch extend after the completion for work (e.g., usually minimum of 30 min. in general or 2 hrs for roofs)?	☐	☐	☐
8	**Waste** {5.4}: Are accumulations of waste materials, dust, and debris removed at the end of each shift (or more frequently as needed)?	☐	☐	☐
	☐ Are materials subject to spontaneous ignition (e.g., oily rags) stored in listed disposal containers?	☐	☐	☐
9	**Trash Chutes** {5.4}: Are trash chutes non-combustible, or provided with sprinkler protection?	☐	☐	☐
10	**Flammable/Combustible Liquids** {5.5}: Are flammable/combustible liquids in proper containers and is there less than a total of 60 gallons inside and within 50 feet of the structure?	☐	☐	☐
11	**Compressed Gases** { IFC Chapter 53}: Are compressed gases properly stored and being used?	☐	☐	☐

SUCF Project No. _____

#	*All bracketed references are from* **NFPA 241**, *Standard for Safeguarding Construction, Alteration, and Demolition Operations, unless otherwise noted. This is not a completed list of requirements.*	YES	NO	N/A
12	**Electrical** {6.1}:			
	☐ Are extension cords rated and free from damage?	☐	☐	☐
	☐ Do all branch circuits originate in approved power outlets or panel boards with over-current protection?	☐	☐	☐
	☐ Are all circuits grounded?	☐	☐	☐
13	**Lighting** {6.1.3}:			
	☐ Do all temporary lights have guards?	☐	☐	☐
	☐ Are lights only suspended by their cords when designated to be so suspended?	☐	☐	☐
	☐ Are they fastened securely, if necessary, to prevent ignition of combustible materials?	☐	☐	☐
14	**Fire Safety Plan** {7.1}: Has a fire safety plan been established and has a Fire Prevention Program Superintendent been designated?	☐	☐	☐
15	**Fire Alarms {7.4}:**			
	☐ Is there a readily available pull box for fire alarms?	☐	☐	☐
	☐ If a telephone is used, are instructions clearly posted?	☐	☐	☐
16	**Command Post/Evac Area {7.5}**			
	☐ Is there a designated command post provided with plans, emergency info., keys, communication, and other equipment as needed?	☐	☐	☐
	☐ Is there a clear post-evacuation muster location?	☐	☐	☐
17	**Fire Access** {7.5}:			
	☐ Are pre-approved fire department access routes being maintained?	☐	☐	☐
	☐ Is there clear access to hydrants, standpipe and fire department connections?	☐	☐	☐
18	**Standpipes** {7.6, 8.7.4}: Are standpipes ready for use, and remain within one floor of the top level during construction/demolition?	☐	☐	☐
19	**Egress** {7.8}: Is the means of egress acceptable (e.g. properly marked, clear, safe, lighted)?	☐	☐	☐
20	**Sprinkler** {8.7.3}:			
	☐ Is the sprinkler in place as son as practicable following construction?	☐	☐	☐
	☐ Are sprinkler valves checked at the end of each shift?	☐	☐	☐
21	**Fire Cutoffs** {8.6.1}:			
	☐ Are fire walls and exit stairwells, where required for the completed building, given construction priority for installation?	☐	☐	☐
	☐ Are fire doors installed as soon as practicable?	☐	☐	☐
22	**Stairs** {7.5.6}: Is a stairwell provided for the building?	☐	☐	☐
	☐ Is the stairwell extended upward as each floor is installed in new construction and maintained for each floor still remaining in demolotion?	☐	☐	☐
	☐ Is it lighted?	☐	☐	☐
	☐ Is it enclosed when the building exterior walls are in place?	☐	☐	☐
	☐ Is signage provided indicating floor level, stair designation, and exit path directions?	☐	☐	☐
	☐ Are extinguishers provided at each floor?	☐	☐	☐
23	**Impairments to fire protection systems or fire alarm, detection or communication systems {7.2.4.6}:**			
	☐ Are temporary impairments of all fire protection devices and alarm/detection systems immediately removed upon completion of work in the area and at the end of each shift?	☐	☐	☐
	☐ Is there an impairment coordinator?	☐	☐	☐
	Number of Violations:			

SUCF Project No.

Notes:

Completed Report Submission Information:

Distribution: Contractor, Campus, CEO, Project File

Submitted to:

Submission Date:

Reviewer:

Date of Review:

081056-00

Renovate Peregrine Dining Hall, Building No. 032

Peregrine Dining Hall | | III

KSQ Design	286 Madison Ave, 22nd Fl, New York, NY 10017
LERA	40 Wall Street, New York, NY 10005
Fellenzer Engineering	22 Mulberry Street, Suite 2A, Middletown, NY 10940

Douglas P. Gonzalez | Armand Quadrini | John Fellenzer

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SECTION 01 42 00 – REFERENCES STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic contract definitions are included in the Conditions of the Contract.

B. "Indicated": The term "indicated" refers to graphic representations, notes, or schedules on the Drawings, or other paragraphs or Schedules in the Specifications, and similar requirements in the Contract Documents. Terms such as "shown," "noted," "scheduled," and "specified" are used to help the reader locate the reference. Location is not limited.

C. "Directed": Terms such as "directed," "requested," "authorized," "selected," "approved," "required," and "permitted" mean directed by the Architect, requested by the Architect, and similar phrases.

D. "Approved": The term "approved," when used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the Architect's duties and responsibilities as stated in the Conditions of the Contract.

E. "Regulations": The term "regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": The term "furnish" means supply and deliver to the Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": The term "install" describes operations at the Project Site including the actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": The term "provide" means to furnish and install, complete and ready for the intended use.

I. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, to perform a particular construction activity, including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.

1. The term "experienced," when used with the term "installer," means having a minimum of 5 previous projects similar in size and scope to this Project, being familiar with the special requirements indicated, and having complied with requirements of authorities having jurisdiction.

2. Trades: Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.

    a. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.

J. "Project Site" is the space available to the Contractor for performing construction activities, either exclusively or in conjunction, with others performing other work as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land on which the Project is to be built.

K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.3 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on CSI's 33-Division format and MasterFormat's numbering system.

B. Specification Content: This Specification uses certain conventions regarding the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

1. Abbreviated Language: Language used in Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words will be interpreted as

plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.

2. Streamlined Language: The Specifications generally use the imperative mood and streamlined language. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.

   a. The words "shall be" are implied where a colon (:) is used within a sentence or phrase.

1.4 INDUSTRY STANDARDS

A. Applicability of Standards: Except where the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with the standards in effect as of the date of the Contract Documents.

C. Conflicting Requirements: Where compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer to the Architect before proceeding for a decision on requirements that are different but apparently equal, and where it is uncertain which requirement is the most stringent.

   1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum acceptable. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.

D. Copies of Standards: Each entity engaged in construction on the Project is required to be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

   1. Where copies of standards are needed to perform a required construction activity, the Contractor shall obtain copies directly from the publication source.

E. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where such acronyms or abbreviations are used in the Specifications or other Contract Documents, they mean the recognized name of the trade association, standards-generating organization, authorities having jurisdiction, or other entity applicable to the context of the text provision. Refer to Gale Research Co.'s "Encyclopedia of Associations," available in most libraries.

F. Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations, as referenced in the Contract Documents, are defined to mean the associated names. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

AA	Aluminum Association 900 19th St., NW, Suite 300 Washington, DC 20006	(202) 862-5104
AABC	Associated Air Balance Council 1518 K St., NW Washington, DC 20005	(202) 737-0202
AAMA	American Architectural Manufacturers Assoc. 1540 E. Dundee Road, Suite 310 Palatine, IL 60067	(708) 202-1350
AAN	American Association of Nurserymen 1250 Eye St., NW, Suite 500 Washington, DC 20005	(202) 789-2900
AASHTO	American Association of State Highway and Transportation Officials 444 North Capitol St., Suite 24 Washington, DC 20001	(202) 624-5800
AATCC	American Association of Textile Chemists and Colorists P.O. Box 12215 Research Triangle Park, NC 27709-2215	(919) 549-8141
ABMA	American Bearing Manufacturers Assoc. 1101 Connecticut Ave., NW, Suite 700 Washington, DC 20036	(202) 429-5155
ACI	American Concrete Institute P.O. Box 19150 Detroit, MI 48219	(313) 532-2600

ACIL	American Council of Independent Laboratories 1629 K St., NW Washington, DC 20006	(202) 887-5872
ACPA	American Concrete Pipe Assoc. 8300 Boone Blvd., Suite 400 Vienna, VA 22182	(703) 821-1990
ADC	Air Diffusion Council One Illinois Center, Suite 200 111 East Wacker Dr. Chicago, IL 60601-4298	(312) 616-0800
AFBMA	Anti-Friction Bearing Manufacturers Assoc. (Now ABMA)	
AFPA	American Forest and Paper Assoc. (American Wood Council of the) 2nd Floor, 1250 Connecticut Ave., NW Washington, DC 20036	(202) 463-2455
AGA	American Gas Assoc. 1515 Wilson Blvd. Arlington, VA 22209	(703) 841-8400
AHA	American Hardboard Assoc. 1210 W. Northwest Highway Palatine, IL 60067	(708) 934-8800
AHAM	Association of Home Appliance Manufacturers 20 N. Wacker Dr., Suite 1500 Chicago, IL 60606	(312) 984-5800
AI	Asphalt Institute Research Park Dr. P.O. Box 14052 Lexington, KY 40512-4052	(606) 288-4960
AIA	The American Institute of Architects 1735 New York Ave., NW Washington, DC 20006	(202) 626-7300
AIA	American Insurance Assoc. 1130 Connecticut Ave., NW, Suite 1000 Washington, DC 20036	(202) 828-7100
AIHA	American Industrial Hygiene Assoc. 2700 Prosperit Ave., Suite 250	

	Fairfax, VA 22031	(703) 849-8888
AISC	American Institute of Steel Construction One East Wacker Dr., Suite 3100 Chicago, IL 60601-2001	(312) 670-2400
AISI	American Iron and Steel Institute 1101 17th St., NW Washington, DC 20036-4700	(202) 452-7100
AITC	American Institute of Timber Construction 7012 S. Revere Parkway, #140 Englewood, CO 80112	(303) 792-9559
ALI	Associated Laboratories, Inc. c/o HOH Chemicals 500 S. Vermont St. Palatine, IL 60067	(708) 358-7400
ALSC	American Lumber Standards Committee P.O. Box 210 Germantown, MD 20875	(301) 972-1700
AMCA	Air Movement and Control Assoc. 30 W. University Dr. Arlington Heights, IL 60004-1893	(708) 394-0150
ANSI	American National Standards Institute 11 West 42nd St., 13th Floor New York, NY 10036	(212) 642-4900
AOAC	AOAC International 2200 Wilson Blvd., Suite 400 Arlington, VA 22201-3301	(703) 522-3032
AOSA	Association of Official Seed Analysts California State Seed Laboratory 1220 N St. Sacramento, CA 95814	(916) 445-4521
APA	American Plywood Assoc. P.O. Box 11700 Tacoma, WA 98411	(206) 565-6600
API	American Petroleum Institute 1220 L St., NW Washington, DC 20005	(202) 682-8000

ARI	Air-Conditioning and Refrigeration Institute 4301 Fairfax Dr., Suite 425 Arlington, VA 22203	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Assoc. 6000 Executive Dr., Suite 201 Rockville, MD 20852-3803	(301) 231-9050
ASA	Acoustical Society of America 500 Sunnyside Blvd. Woodbury, NY 11797	(516) 576-2360
ASC	Adhesive and Sealant Council 1627 K St., NW, Suite 1000 Washington, DC 20006-1707	(202) 452-1500
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers 1791 Tullie Circle, NE Atlanta, GA 30329	(404) 636-8400
ASME	American Society of Mechanical Engineers 345 East 47th St. New York, NY 10017	(212) 705-7722
ASPA	American Sod Producers Assoc. 1855-A Hicks Rd. Rolling Meadows, IL 60008	(708) 705-9898
ASPE	American Society of Plumbing Engineers 3617 Thousand Oaks Blvd., Suite 210 Westlake, CA 91362	(805) 495-7120
ASSE	American Society of Sanitary Engineering P.O. Box 40362 Bay Village, OH 44140	(216) 835-3040
ASTM	American Society for Testing and Materials 1916 Race St. Philadelphia, PA 19103-1187	(215) 299-5400
ATIS	Alliance for Telecommunications Industry Solutions 1200 G St., NW, Suite 500 Washington, DC 20005	(202) 628-6380
AWCMA	American Window Covering Manufacturers Assoc. (Now WCMA)	

AWI	Architectural Woodwork Institute P.O. Box 1550 13924 Braddock Rd., No. 100 Centerville, VA 22020	(703) 222-1100
AWPA	American Wood Preservers' Assoc. P.O. Box 286 Woodstock, MD 21163-0286	(410) 465-3169
AWPB	American Wood Preservers' Bureau (This organization is now defunct.)	
AWS	American Welding Society 550 LeJeune Rd., NW Miami, FL 33126	(305) 443-9353
AWWA	American Water Works Assoc. 6666 W. Quincy Ave. Denver, CO 80235	(303) 794-7711
BANC	Brick Association of North Carolina P.O. Box 13290 Greensboro, NC 27415-3290	(910) 273-5566
BHMA	Builders' Hardware Manufacturers Assoc. 355 Lexington Ave., 17th Floor New York, NY 10017	(212) 661-4261
BIA	Brick Institute of America 11490 Commerce Park Dr. Reston, VA 22091	(703) 620-0010
BIFMA	The Business and Institutional Furniture Manufacturer's Association 2680 Horizon Dr., SE, Suite A1 Grand Rapids, MI 49546-7500	(616) 285-3963
CAGI	Compressed Air and Gas Institute c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851	(216) 241-7333
CAUS	Color Association of the United States 409 W. 44th St. New York, NY 10036	(212) 582-6884

CBHF	State of California, Dept. of Consumer Affairs Bureau of Home Furnishings and Thermal Insulation 3485 Orange Grove Ave. North Highland, CA 95660-5595	(800) 952-5210
CBM	Certified Ballast Manufacturers Assoc. 1422 Euclid Ave., Suite 402 Cleveland, OH 44115-2851	(216) 241-0711
CCC	Carpet Cushion Council P.O. Box 546 Riverside, CT 06878	(203) 637-1312
CDA	Copper Development Association Inc. 260 Madison Ave., 16th Floor New York, NY 10016	(212) 251-7200
CFFA	Chemical Fabrics & Film Association, Inc. c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851	(216) 241-7333
CGA	Compressed Gas Assoc. 1725 Jefferson Davis Highway, Suite 1004 Arlington, VA 22202-4100	(703) 412-0900
CISCA	Ceiling and Interior Systems Construction Assoc. 579 W. North Ave., Suite 301 Elmhurst, IL 60126	(708) 833-1919
CISPI	Cast Iron Soil Pipe Institute 5959 Shallowford Rd., Suite 419 Chattanooga, TN 37421	(615) 892-0137
CRI	Carpet and Rug Institute P.O. Box 2048 Dalton, GA 30722	(706) 278-3176
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Rd. Schaumburg, IL 60173	(708) 517-1200
CTI	Ceramic Tile Institute of America 12061 West Jefferson Blvd. Culver City, CA 90230	(310) 574-7800

DHI	Door and Hardware Institute 14170 Newbrook Dr. Chantilly, VA 22021-2223	(703) 222-2010
DIPRA	Ductile Iron Pipe Research Assoc. 245 Riverchase Parkway East, Suite O Birmingham, AL 35244	(205) 988-9870
DLPA	Decorative Laminate Products Assoc. 13924 Braddock Rd. Centreville, VA 22020	(800) 684-3572
ECSA	Exchange Carriers Standards Assoc. (Now ATIS)	
EIA	Electronic Industries Assoc. 2001 Pennsylvania Ave., NW Washington, DC 20006-1813	(202) 457-4900
EIMA	EIFS Industry Manufacturers Assoc. 2759 State Road 580, Suite 112 Clearwater, FL 34621	(813) 726-6477
EJMA	Expansion Joint Manufacturers Assoc. 25 N. Broadway Tarrytown, NY 10591	(914) 332-0040
ETL	ETL Testing Laboratories, Inc. P.O. Box 2040 3933 Route 11, Industrial Park Cortland, NY 13045	(607) 753-6711
FCI	Fluid Controls Institute P.O. Box 9036 Morristown, NJ 07960	(201) 829-0990
FCIB	Floor Covering Installation Board 310 Holiday Ave. Dalton, GA 30720	(706) 226-5488
FGMA	Flat Glass Marketing Assoc. White Lakes Professional Bldg. 3310 S.W. Harrison St. Topeka, KS 66611-2279	(913) 266-7013

FM	Factory Mutual Systems 1151 Boston-Providence Turnpike P.O. Box 9102 Norwood, MA 02062	(617) 762-4300
FTI	Facing Tile Institute P.O. Box 8880 Canton, OH 44711	(216) 488-1211
GA	Gypsum Association 810 First St., NE, Suite 510 Washington, DC 20002	(202) 289-5440
HEI	Heat Exchange Institute c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851	(216) 241-7333
HI	Hydronics Institute P.O. Box 218 35 Russo Place Berkeley Heights, NJ 07922	(908) 464-8200
HI	Hydraulic Institute 9 Sylvan Way Parsippany, NJ 07054-3802	(201) 267-9700
HMA	Hardwood Manufacturers Assoc. 400 Penn Center Blvd. Pittsburgh, PA 15235	(412) 829-0770
HPVA	Hardwood Plywood and Veneer Assoc. 1825 Michael Farraday Dr. P.O. Box 2789 Reston, VA 22090	(703) 435-2900
IBD	Institute of Business Designers 341 Merchandise Mart Chicago, IL 60654	(312) 467-1950
ICEA	Insulated Cable Engineers Association, Inc. P.O. Box 440 South Yarmouth, MA 02664	(508) 394-4424
IEC	International Electrotechnical Commission (Available from ANSI) 1430 Broadway	

	New York, NY 10018	(212) 354-3300
IEEE	Institute of Electrical and Electronic Engineers 345 E. 47th St. New York, NY 10017	(212) 705-7900
IESNA	Illuminating Engineering Society of North America 345 E. 47th St. New York, NY 10017	(212) 705-7913
IGCC	Insulating Glass Certification Council c/o ETL Testing Laboratories, Inc. P.O. Box 2040 Route 11, Industrial Park Cortland, NY 13045	(607) 753-6711
ILI	Indiana Limestone Institute of America Stone City Bank Building, Suite 400 Bedford, IN 47421	(812) 275-4426
IMSA	International Municipal Signal Assoc. 165 E. Union St. Newark, NY 14513	(315) 331-2182
IRI	Industrial Risk Insurers P.O. Box 5010 85 Woodland St. Hartford, CT 06102-5010	(203) 520-7300
ISA	Instrument Society of America P.O. Box 12277 67 Alexander Dr. Research Triangle Park, NC 27709	(919) 549-8411
KCMA	Kitchen Cabinet Manufacturers Assoc. 1899 Preston White Dr. Reston, VA 22091-4326	(703) 264-1690
LIA	Lead Industries Association, Inc. 295 Madison Ave. New York, NY 10017	(212) 578-4750
LPI	Lightning Protection Institute 3365 N. Arlington Heights Rd., Suite J Arlington Heights, IL 60004	(800) 488-6864
MBMA	Metal Building Manufacturer's Assoc. c/o Thomas Associates, Inc.	

	1300 Sumner Ave. Cleveland, OH 44115-2851	(216) 241-7333
MCAA	Mechanical Contractors Association of America 1385 Piccard Dr. Rockville, MD 20850-4329	(301) 869-5800
MFMA	Maple Flooring Manufacturers Assoc. 60 Revere Dr., Suite 500 Northbrook, IL 60062	(708) 480-9138
MIA	Marble Institute of America 33505 State St. Farmington, MI 48335	(810) 476-5558
ML/SFA	Metal Lath/Steel Framing Assoc. (A Division of the National Association of Architectural Metal Manufacturers) 600 S. Federal St., Suite 400 Chicago, IL 60605	(312) 922-6222
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry 127 Park St., NE Vienna, VA 22180	(703) 281-6613
NAA	National Arborist Assoc. The Meeting Place Mall Route 101, P.O. Box 1094 Amherst, NH 03031-1094	(603) 673-3311
NAAMM	National Association of Architectural Metal Manufacturers 600 S. Federal St., Suite 400 Chicago, IL 60605	(312) 922-6222
NAIMA	North American Insulation Manufacturers Assoc. 44 Canal Center Plaza, Suite 310 Alexandria, VA 22314	(703) 684-0084
NAPA	National Asphalt Pavement Assoc. NAPA Building 5100 Forbes Blvd. Lanham, MD 20706-4413	(301) 731-4748

NAPF	National Association of Plastic Fabricators (Now DLPA)	
NBGQA	National Building Granite Quarries Assoc. P.O. Box 482 Barre, VT 05641	(802) 476-3115
NBHA	National Builders Hardware Assoc. (Now DHI)	
NCMA	National Concrete Masonry Assoc. 2302 Horse Pen Rd. Herndon, VA 22071-3406	(703) 713-1900
NCPI	National Clay Pipe Institute P.O. Box 759 253-80 Center St. Lake Geneva, WI 53147	(414) 248-9094
NCRPM	National Council on Radiation Protection and Measurements 7910 Woodmont Ave., Suite 800 Bethesda, MD 20814	(301) 657-2652
NCSPA	National Corrugated Steel Pipe Association 1255 23rd St., NW, Suite 850 Washington, DC 20037	(202) 452-1700
NEC	National Electrical Code (from NFPA)	
NECA	National Electrical Contractors Assoc. 3 Bethesda Metro Center, Suite 1100 Bethesda, MD 20814	(301) 657-3110
NEII	National Elevator Industry, Inc. 185 Bridge Plaza, North Fort Lee, NJ 07024	(201) 944-3211
NEMA	National Electrical Manufacturers Assoc. 2101 L St., NW, Suite 300 Washington, DC 20037	(202) 457-8400
NETA	International Electrical Testing Assoc. P.O. Box 687 Morrison, CO 80465	(303) 697-8441

NFPA	National Fire Protection Assoc. One Batterymarch Park P.O. Box 9101 Quincy, MA 02269-9101	 (617) 770-3000 (800) 344-3555
NFPA	National Forest Products Assoc. (Now AFPA)	
NHLA	National Hardwood Lumber Assoc. P.O. Box 34518 Memphis, TN 38184-0518	 (901) 377-1818
NKCA	National Kitchen Cabinet Assoc. (Now KCMA)	
NLGA	National Lumber Grades Authority 4400 Dominion St., Suite 103 Burnaby, BC V5G 4G3	 (604) 451-7323
NOFMA	National Oak Flooring Manufacturers Assoc. P.O. Box 3009 Memphis, TN 38173-0009	 (901) 526-5016
NPA	National Particleboard Assoc. 18928 Premiere Ct. Gaithersburg, MD 20879	 (301) 670-0604
NPCA	National Paint and Coatings Assoc. 1500 Rhode Island Ave., NW Washington, DC 20005	 (202) 462-6272
NRCA	National Roofing Contractors Assoc. 10255 W. Higgins Rd., Suite 600 Rosemont, IL 60018-5607	 (708) 299-9070
NSF	National Sanitation Foundation 3475 Plymouth Rd. P.O. Box 130140 Ann Arbor, MI 48113-0140	 (313) 769-8010
NSSEA	National School Supply and Equipment Assoc. 8300 Colesville Rd., No. 250 Silver Spring, MD 20910	 (301) 495-0240
NTMA	National Terrazzo and Mosaic Assoc. 3166 Des Plaines Ave., Suite 132 Des Plaines, IL 60018	 (708) 635-7744

NWMA	National Woodwork Manufacturers Assoc. (Now NWWDA)	
NWWDA	National Wood Window and Door Assoc. 1400 E. Touhy Ave., #G54 Des Plaines, IL 60018	 (708) 299-5200 (800) 223-2301
PATMI	Power Actuated Tool Manufacturers' Institute, Inc. 1000 Fairgrounds Rd., Suite 200 St. Charles, MO 63301	 (314) 947-6610
PCA	Portland Cement Assoc. 5420 Old Orchard Rd. Skokie, IL 60077	 (708) 966-6200
PCI	Precast/Prestressed Concrete Institute 175 W. Jackson Blvd. Chicago, IL 60604	 (312) 786-0300
PDI	Plumbing and Drainage Institute c/o Sol Baker 1106 W. 77th St., South Dr. Indianapolis, IN 46260	 (317) 251-6970
PEI	Porcelain Enamel Institute 102 Woodmont Blvd., Suite 360 Nashville, TN 38205	 (615) 385-0758
RFCI	Resilient Floor Covering Institute 966 Hungerford Dr., Suite 12-B Rockville, MD 20805	 (301) 340-8580
RIS	Redwood Inspection Service 405 Enfrente Dr., Suite 200 Novato, CA 94949	 (415) 382-0662
RMA	Rubber Manufacturers Assoc. 1400 K St., NW Washington, DC 20005	 (202) 682-4800
SDI	Steel Deck Institute P.O. Box 9506 Canton, OH 44711	 (216) 493-7886
SDI	Steel Door Institute 30200 Detroit Rd. Cleveland, OH 44145	 (216) 889-0010

SGCC	Safety Glazing Certification Council c/o ETL Testing Laboratories Route 11, Industrial Park Cortland, NY 13045	(607) 753-6711
SHLMA	Southern Hardwood Lumber Manufacturers Assoc. (Now HMA)	
SIGMA	Sealed Insulating Glass Manufacturers Assoc. 401 N. Michigan Ave. Chicago, IL 60611	(312) 644-6610
SJI	Steel Joist Institute 1205 48th Avenue North, Suite A Myrtle Beach, SC 29577	(803) 449-0487
SMA	Screen Manufacturers Assoc. 3950 Lake Shore Dr., Suite 502-A Chicago, IL 60613-3431	(312) 525-2644
SMACNA	Sheet Metal and Air Conditioning Contractors National Assoc. 4201 Lafayette Center Dr. Chantilly, VA 22021	(703) 803-2980
SPIB	Southern Pine Inspection Bureau 4709 Scenic Highway Pensacola, FL 32504	(904) 434-2611
SPRI	Single Ply Roofing Institute 20 Walnut St. Wellesley Hills, MA 02181	(617) 237-7879
SSPC	Steel Structures Painting Council 4516 Henry St. Pittsburgh, PA 15213	(412) 687-1113
SSPMA	Sump and Sewage Pump Manufacturers Assoc. P.O. Box 647 Northbrook, IL 60065-0647	(708) 559-9233
STI	Steel Tank Institute 570 Oakwood Rd. Lake Zurich, IL 60047	(708) 438-8265

SWI	Steel Window Institute c/o Thomas Associates, Inc. 1300 Sumner Ave. Cleveland, OH 44115-2851	(216) 241-7333
SWPA	Submersible Wastewater Pump Assoc. 600 S. Federal St., Suite 400 Chicago, IL 60605	(312) 922-6222
TCA	Tile Council of America P.O. Box 326 Princeton, NJ 08542-0326	(609) 921-7050
TIMA	Thermal Insulation Manufacturers Assoc. (This Organization is now defunct. See NAIMA)	
TPI	Truss Plate Institute 583 D'Onofrio Dr., Suite 200 Madison, WI 53719	(608) 833-5900
UL	Underwriters Laboratories 333 Pfingsten Rd. Northbrook, IL 60062	(708) 272-8800
UNI	Uni-Bel PVC Pipe Assoc. 2655 Villa Creek Dr., Suite 155 Dallas, TX 75234	(214) 243-3902
USP	U.S. Pharmacopoeial Convention 12601 Twinbrook Parkway Rockville, MD 20852	(301) 881-0666
WA	Wallcoverings Assoc. 401 N. Michigan Ave. Chicago, IL 60611-4267	(312) 644-6618
WCLIB	West Coast Lumber Inspection Bureau P.O. Box 23145 Portland, OR 97281	(503) 639-0651
WCMA	Window Covering Manufacturers Assoc. 355 Lexington Ave., 17th Floor New York, NY 10017	(212) 661-4261
WIC	Woodwork Institute of California P.O. Box 11428	

	Fresno, CA 93773-1428	(209) 233-9035
WLPDIA	Western Lath, Plaster, Drywall Industries Assoc. (Formerly California Lath & Plaster Assoc.) 8635 Navajo Rd. San Diego, CA 92119	(619) 229-8307
WRI	Wire Reinforcement Institute 1101 Connecticut Ave. NW, Suite 700 Washington, DC 20036-4303	(202) 429-5125
WSC	Water Systems Council 600 S. Federal St., Suite 400 Chicago, IL 60605	(312) 922-6222
WSFI	Wood and Synthetic Flooring Institute 4415 W. Harrison St., Suite 242-C Hillside, IL 60162	(708) 449-2933
WWPA	Western Wood Products Assoc. Yeon Building 522 SW 5th Ave. Portland, OR 97204-2122	(503) 224-3930
WWPA	Woven Wire Products Assoc. 2515 N. Nordica Ave. Chicago, IL 60635	(312) 637-1359

G. Federal Government Agencies: Names and titles of federal government standard- or Specification-producing agencies are often abbreviated. The following acronyms or abbreviations referenced in the Contract Documents indicate names of standard- or Specification-producing agencies of the federal government. Names and addresses are subject to change and are believed, but are not assured, to be accurate and up-to-date as of the date of the Contract Documents.

CE	Corps of Engineers (U.S. Department of the Army) Chief of Engineers - Referral Washington, DC 20314	(202) 272-0660
CFR	Code of Federal Regulations (Available from the Government Printing Office) N. Capitol St. between G and H St., NW Washington, DC 20402 (Material is usually first published in the "Federal Register")	(202) 783-3238

CPSC	Consumer Product Safety Commission 5401 Westbard Ave. Bethesda, MD 20207	(800) 638-2772
CS	Commercial Standard (U.S. Department of Commerce) Government Printing Office Washington, DC 20402	(202) 783-3238
DOC	Department of Commerce 14th St. and Constitution Ave., NW Washington, DC 20230	(202) 482-2000
DOT	Department of Transportation 400 Seventh St., SW Washington, DC 20590	(202) 366-4000
EPA	Environmental Protection Agency 401 M St., SW Washington, DC 20460	(202) 382-2090
FAA	Federal Aviation Administration (U.S. Department of Transportation) 800 Independence Ave., SW Washington, DC 20590	(202) 366-4000
FCC	Federal Communications Commission 1919 M St., NW Washington, DC 20554	(202) 632-7000
FDA	Food and Drug Administration 5600 Fishers Lane Rockville, MD 20857	(301) 443-1544
FHA	Federal Housing Administration (U.S. Department of Housing and Urban Development) 451 Seventh St., SW Washington, DC 20201	(202) 708-1422
FS	Federal Specification (from GSA) Specifications Unit (WFSIS) 7th and D St., SW Washington, DC 20407	(202) 708-9205
GSA	General Services Administration F St. and 18th St., NW	

	Washington, DC 20405	(202) 708-5082
MIL	Military Standardization Documents (U.S. Department of Defense) Naval Publications and Forms Center 5801 Tabor Ave. Philadelphia, PA 19120	
NIST	National Institute of Standards and Technology (U.S. Department of Commerce) Gaithersburg, MD 20899	(301) 975-2000
OSHA	Occupational Safety and Health Administration (U.S. Department of Labor) 200 Constitution Ave., NW Washington, DC 20210	(202) 219-6091
PS	Product Standard of NBS (U.S. Department of Commerce) Government Printing Office Washington, DC 20402	(202) 783-3238
REA	Rural Electrification Administration (U.S. Department of Agriculture) 14th St. and Independence Ave., SW Washington, DC 20250	(202) 447-2791
USDA	U.S. Department of Agriculture Independence Ave. between 12th St. and 14th St., SW Washington, DC 20250	(202) 720-2791
USPS	U.S. Postal Service 475 L'Enfant Plaza, SW Washington, DC 20260-0010	(202) 268-2000

1.5 GOVERNING REGULATIONS AND AUTHORITIES

A. Copies of Regulations: Obtain copies of the following regulations and retain at the Project Site to be available for reference by parties who have a reasonable need.

1.6 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional

settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established in conjunction with compliance with standards and regulations bearing upon performance of the Work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 42 00

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SECTION 01 45 00 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality-control services.

B. Quality-control services include inspections, tests, and related actions, including reports performed by Contractor, by independent agencies, and by governing authorities. They do not include contract enforcement activities performed by Architect.

C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with Contract Document requirements.

D. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.

1. Specific quality-control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified inspections, tests, and related actions do not limit Contractor's quality-control procedures that facilitate compliance with Contract Documents. Requirements.
3. Requirements for Contractor to provide quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

E. Related Sections: The following Sections contain requirements that relate to this Section:

1. Division 1 Section "Cutting and Patching" specifies requirements for repair and restoration of construction disturbed by inspection and testing activities.
2. Division 1 Section "Submittals" specifies requirements for development of a schedule of required tests and inspections.

F. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements, comply with the most stringent requirement. Refer uncertainties to Architect for a decision.

G. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum. The actual installation may exceed the minimum within reasonable limits. Indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision.

H. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, notices, receipts for fee payments, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

I. Testing Agency Qualifications: An independent agency with the experience and capability to conduct testing and inspecting indicated; and where required by authorities having jurisdiction, that is acceptable to authorities.

J. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

K. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Promptly notify Architect and Contractor of irregularities or deficiencies in the Work observed during performance of its services.
2. Do not release, revoke, alter, or increase requirements of the Contract Documents or approve or accept any portion of the Work.
3. Do not perform any duties of Contractor.

L. Associated Services: Cooperate with testing agencies and provide reasonable auxiliary services as requested. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Security and protection for samples and for testing and inspecting equipment.

M. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.3 RESPONSBILITIES

A. Contractor Responsibilities: Unless otherwise indicated as the responsibility of another identified entity, Contractor shall provide inspections, tests, and other quality-control services specified elsewhere in the Contract Documents and required by authorities having jurisdiction. Costs for these services are included in the Contract Sum.

1. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Contractor's responsibility, the Contractor shall employ and pay a qualified independent testing agency to perform quality-control services. Costs for these services are included in the Contract Sum.
2. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility, the Owner will employ and pay a qualified independent testing agency to perform those services.
3. Where individual Sections specifically indicate that certain inspections, tests, and other quality-control services are the Owner's responsibility, the Owner will engage the services of a qualified independent testing agency to perform those services. Payment for these services will be made from the Inspection and Testing Allowance, as authorized by Change Orders.

    a. Where the Owner has engaged a testing agency for testing and inspecting part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the Owner, unless agreed to in writing by the Owner.

B. Retesting: The Contractor is responsible for retesting where results of inspections, tests, or other quality-control services prove unsatisfactory and indicate noncompliance with Contract Document requirements, regardless of whether the original test was Contractor's responsibility.

1. The cost of retesting construction, revised or replaced by the Contractor, is the Contractor's responsibility where required tests performed on original construction indicated noncompliance with Contract Document requirements.

C. Associated Services: Cooperate with agencies performing required inspections, tests, and similar services, and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include, but are not limited to, the following.

1. Provide access to the Work.
2. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
3. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
4. Provide facilities for storage and curing of test samples.
5. Deliver samples to testing laboratories.
6. Provide the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.

7. Provide security and protection of samples and test equipment at the Project Site.

D. Duties of the testing Agency: The independent agency engaged to perform inspections, sampling, and testing of materials and construction specified in individual Sections shall cooperate with the Architect, and the Contractor in performance of the agency's duties. The testing agency shall provide qualified personnel to perform required inspections and tests.

1. The agency shall notify the Architect, and the Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.
3. The agency is not authorized to release, revoke, alter or enlarge requirements of the Contract Documents or approve or accept any portion of the Work.

E. Coordination: Coordinate the sequence of activities to accommodate required services with a minimum of delay.

1. Coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
2. The Architect is responsible for scheduling times for inspections tests, taking samples, and similar activities.

1.4 SUBMITTALS

A. Unless the Contractor is responsible for this service, the independent testing agency shall submit a certified written report, induplicate, of each inspection, test, or similar service through the Contractor.

1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
2. Report Data: Written reports of each inspection, test, or similar service include, but are not limited to, the following:

a. Date of issue.
b. Project title and number.
c. Name, address, and telephone number of testing agency.
d. Dates and locations of samples and tests or inspections.
e. Names of individuals making the inspection or test.
f. Designation of the Work and test method.
g. Identification of product and Specification Section.
h. Complete inspection or test data.
i. Test results and an interpretations of test results.
j. Ambient conditions at the time of sample taking and testing.
k. Comments or professional opinion on whether inspected or tested Work complies with Contract document requirements.
l. Name and signature of laboratory inspector.

m. Recommendations on retesting.

1.5 QUALITY ASSURANCE

A. Qualifications for Service Agencies: Engage inspection and testing service agencies, including independent testing laboratories, that are pre-qualified as complying with the American Council of Independent Laboratories "Recommended Requirements for Independent Laboratory Qualification" and that specialize in the types of inspections and test to be performed.

1. Each independent inspection and testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the state where the project is located.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: Upon completion of inspection, testing, sample taking and similar services, repair damaged construction and restore substrates and finishes. Comply with Contract Document requirements for Division 1 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities, and protect repaired construction.

C. Repair and protection is Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 01 45 00

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SECTION 015639 - TEMPORARY TREE AND PLANT PROTECTION

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes: General protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

B. Related Requirements:

1. Section 311000 "Site Clearing" for removing existing trees and shrubs and for temporary erosion- and sedimentation-control measures if not specified in Section 015000 "Temporary Facilities and Controls".

1.2 DEFINITIONS

A. Caliper: Diameter of a trunk measured by a diameter tape at a height 6 inches (150 mm) above the ground for trees up to and including 4-inch (100-mm) size at this height and as measured at a height of 12 inches (300 mm) above the ground for trees larger than 4-inch (100-mm) size.

B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.

C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.

D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to temporary tree and plant protection including, but not limited to, the following:

a. Tree-service firm's personnel and equipment needed to make progress and avoid delays.
b. Arborist's responsibilities.
c. Quality-control program.
d. Coordination of Work and equipment movement with the locations of protection zones.
e. Trenching by hand or with air spade within protection zones.
f. Field quality control.

1.4 ACTION SUBMITTALS

A. Product Data:

1. General protection and pruning of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction

B. Shop Drawings:

1. Include plans, elevations, and sections showing trees and plants to be protected, locations of protection-zone fencing and signage, and the relationship between equipment- movement routes and material storage locations with protection zones.
2. Detail fabrication and assembly of protection-zone fencing and signage.
3. Indicate extent of utility boring and trenching by hand or with air spade within protection zones.

C. Samples: For each type of the following:

1. Organic Mulch: 1-pint (0.5-L) volume of organic mulch; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch.
2. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components.
3. Protection-Zone Signage: Full-size Samples of each size and text, ready for installation.

D. Tree-Pruning Schedule: Written schedule detailing scope and extent of pruning of trees to remain that interfere with or are affected by construction.

1. Species and size of tree.
2. Location on site plan. Include unique identifier for each.
3. Reason for pruning.
4. Description of pruning to be performed.
5. Description of maintenance following pruning.

E. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For arborist and tree service firm.

B. Certification: From arborist, certifying that trees indicated to remain have been protected during construction in accordance with recognized standards and that trees were promptly and properly treated and repaired when damaged.

C. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

D. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

1. Use sufficiently detailed photographs or video recordings.
2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain.

E. Quality-control program.

1.6 QUALITY ASSURANCE

A. Arborist Qualifications: Certified Arborist as certified by ISA.

B. Tree-Service Firm Qualifications: An experienced tree-service firm that has successfully completed temporary tree- and plant-protection work similar to that required for this Project and that will assign an experienced, qualified arborist to Project site during execution of the Work.

C. Quality-Control Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work without damaging trees and plantings. Include dimensioned diagrams for placement of protection-zone fencing and signage, the arborist's and tree-service firm's responsibilities, instructions given to workers on the use and care of protection zones, and enforcement of requirements for protection zones.

1.7 FIELD CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Moving or parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

B. Do not direct vehicle or equipment exhaust toward protection zones.

C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

D. Take precautions to protect plants from airborne contaminants, such as paint or fireproofing overspray.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Backfill Soil: Planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

1. Mixture: Well-blended mix of 2 parts stockpiled soil to 1 part planting soil.
2. Planting Soil: Planting soil as specified in Section 329113 "Soil Preparation".

B. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:

1. Type: Wood and bark chips.
2. Size Range: 3 inches (76 mm) maximum, 1/2 inch (13 mm) minimum.
3. Color: Natural.

C. Protection-Zone Fencing: Fencing fixed in position and meeting the following requirements: Previously used materials may be used when approved by Architect.

1. Chain-Link Protection-Zone Fencing: Galvanized-steel fencing fabricated from minimum 2-inch (50-mm) opening, 0.148-inch- (3.76-mm-) diameter wire chain-link fabric; with pipe posts, minimum 2-3/8-inch- (60-mm-) OD line posts, and 2-7/8-inch- (73-mm-) OD corner and pull posts and 0.177-inch- (4.5-mm-) diameter bottom tension wire; with tie wires, hog ring ties, and other accessories for a complete fence system.

a. Height: 72 inches (1800 mm).

D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

B. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

3.2 PREPARATION

A. Locate and clearly identify trees, shrubs, and other vegetation to remain. Flag each tree trunk at 54 inches (1372 mm) above the ground.

B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

3.3 TREE PROTECTION

A. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.

1. Apply 2-inch (50-mm) uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches (150 mm) of tree trunks.

3.4 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected areas except by entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

1. Chain-Link Fencing: Install to comply with ASTM F567 and with manufacturer's written instructions.
2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect. Install one sign spaced approximately every 20 ft. (6 m) on protection-zone fencing, but no fewer than four signs with each facing a different direction.

C. Maintain protection zones free of weeds and trash.

D. Maintain hydration of plants to assure plant survival.

E. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete and equipment has been removed from the site.

1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.

2. Temporary access is permitted subject to preapproval in writing by arborist if a root buffer effective against soil compaction is constructed as directed by arborist. Maintain root buffer so long as access is permitted.

3.5 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones in accordance with requirements in Section 312000 "Earth Moving" unless otherwise indicated.

B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.

3.6 ROOT PRUNING

A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as follows:

1. Cut roots manually by digging a trench and cutting exposed roots with sharp pruning instruments; do not break, tear, chop, or slant the cuts. Do not use a backhoe or other equipment that rips, tears, or pulls roots.
2. Cut Ends: Do not paint cut root ends.
3. Temporarily support and protect roots from damage until they are permanently covered with soil.
4. Cover exposed roots with burlap and water regularly.
5. Backfill as soon as possible in accordance with requirements in Section 312000 "Earth Moving."

B. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

3.7 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune branches as directed by arborist.

1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
3. Pruning Standards: Prune trees in accordance with ANSI A300 (Part 1).

B. Unless otherwise directed by arborist and acceptable to Architect, do not cut tree leaders.

C. Cut branches with sharp pruning instruments; do not break or chop.

D. Do not paint or apply sealants to wounds.

E. Provide subsequent maintenance pruning during Contract period as recommended by arborist.

F. Chip removed branches and spread over areas identified by Architect or otherwise dispose of off-site.

3.8 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Minor Fill within Protection Zone: Where existing grade is 2 inches (50 mm) or less below elevation of finish grade, fill with backfill soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

3.9 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

3.10 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours in accordance with arborist's written instructions.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Trees: Remove and replace trees indicated to remain that are more than 25 percent dead or in an unhealthy condition before the end of the corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

1. Small Trees: Provide new trees of same size and species as those being replaced for each tree that measures 6 inches (150 mm) or smaller in caliper size.

2. Plant and maintain new trees as specified in Section 329300 "Plants."

C. Soil Aeration: Where directed by Architect, aerate surface soil compacted during construction. Aerate 10 ft. (3 m) beyond drip line and no closer than 36 inches (900 mm) to tree trunk. Drill

2-inch- (50-mm-) diameter holes a minimum of 12 inches (300 mm) deep at 24 inches (600 mm) o.c. Backfill holes with an equal mix of augered soil and sand.

END OF SECTION 01 56 39

SECTION 01 60 00 – PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing the Contractor's selection of products for use in the Project.
   1. Single Prime Contract: Provisions of this Section apply to the construction activities of each prime contractor.

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 1 Section "Electronic Submittal Procedures" specifies requirements for submittal of the Contractor's Construction Schedule and the Submittal Schedule.
   2. Division 1 Section "Substitution Procedures" specifies administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 DEFINITIONS

A. Definitions used in this Article are not intended to change the meaning of other terms used in the Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms are self-explanatory and have well-recognized meanings in the construction industry.
   1. "Products" are items purchased for incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
      a. "Named Products" are items identified by the manufacturer's product name, including make or model number or other designation, shown or listed in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
   2. "Materials" are products substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form a part of the Work.
   3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections, such as wiring or piping.

1.4 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind from a single source.
   1. When specified products are available only from sources that do not, or cannot, produce a quantity adequate to complete project requirements in a timely manner, consult with the Architect to determine the most important product qualities before proceeding. Qualities may include attributes, such as visual appearance, strength, durability, or compatibility. When a determination has been made, select products from sources producing products that possess these qualities, to the fullest extent possible.

B. Compatibility of Options: When the Contractor is given the option of selecting between 2 or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.
   1. Each prime contractor is responsible for providing products and construction methods that are compatible with products and construction methods of other prime or separate contractors.
   2. If a dispute arises between prime contractors over concurrently selectable, but incompatible products, the Architect will determine which products shall be retained and which are incompatible and must be replaced.

C. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products that will be exposed to view in occupied spaces or on the exterior.
   1. Labels: Locate required product labels and stamps on concealed surfaces or, where required for observation after installation, on accessible surfaces that are not conspicuous.
   2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
      a. Name of product and manufacturer.
      b. Model and serial number.
      c. Capacity.
      d. Speed.
      e. Ratings.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to the manufacturer's recommendations, using means and methods that will prevent damage, deterioration, and loss, including theft.
   1. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.
   2. Coordinate delivery with installation time to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

3. Deliver products to the site in an undamaged condition in the manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products upon delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.
5. Store products at the site in a manner that will facilitate inspection and measurement of quantity or counting of units.
6. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.
7. Store products subject to damage by the elements above ground, under cover in a weathertight enclosure, with ventilation adequate to prevent condensation. Maintain temperature and humidity within range required by manufacturer's instructions.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, new at the time of installation.
   1. Provide products complete with accessories, trim, finish, safety guards, and other devices and details needed for a complete installation and the intended use and effect.
   2. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: The Contract Documents and governing regulations govern product selection. Procedures governing product selection include the following:
   1. Nonproprietary Specifications: When Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
   2. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.
   3. Performance Specification Requirements: Where Specifications require compliance with performance requirements, provide products that comply with these requirements and are recommended by the manufacturer for the application indicated.
   4. Manufacturer's recommendations may be contained in published product literature or by the manufacturer's certification of performance.

5. Compliance with Standards, Codes, and Regulations: Where Specifications only require compliance with an imposed code, standard, or regulation, select a product that complies with the standards, codes, or regulations specified.
6. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.
7. Where no product available within the specified category matches satisfactorily and complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category.
8. Visual Selection: Where specified product requirements include the phrase "... as selected from manufacturer's standard colors, patterns, textures ..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern, and texture from the product line selected.
9. Allowances: Refer to individual Specification Sections and "Allowance" provisions in Division 1 for allowances that control product selection and for procedures required for processing such selections.

EXECUTION

3.1 INSTALLATION OF PRODUCTS

A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
   1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 01 60 00

SECTION 01 91 13 - COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION

A. Commissioning is a systematic process of verifying that all building systems perform interactively according to the owner's operational needs, the design documents, manufacturer's recommendations, and good engineering and workmanship practices. This is achieved by beginning in the design phase and understanding the owner's requirements and continuing through construction, and acceptance with actual verification of performance. The commissioning process shall encompass and coordinate the traditionally separate functions of system documentation, equipment startup, control system calibration, testing and balancing, performance testing, and training.

B. Commissioning during the construction phase is intended to achieve the following specific objectives according to the Contract Documents:

1. Verify that applicable equipment and systems are installed according to the contract documents, manufacturer's recommendations and to industry accepted minimum standards and that they receive adequate operational checkout by the PC.
2. Verify and document proper performance of equipment and systems.
3. Verify that O&M documentation provided for the project is complete, accurate and represents the actual installed equipment.
4. Verify that the Owner's operating personnel are adequately trained.

C. The commissioning process does not take away from or reduce the responsibility of the system designers or the Prime Contractor (PC) to provide a finished and fully functioning product.

D. Abbreviations: The following are common abbreviations used in the Specifications. Definitions are found in Article 1.3.

A/E -	Architects and Design Engineers	FT -	Functional Performance Test
CxA -	Commissioning Authority	PC -	Prime Contractor
Cx -	Commissioning	PFI -	Pre-Functional Inspection
Cx Plan -	Commissioning Plan Document	PM -	Project Manager (of the owner)

1.3 DEFINITIONS

A. Acceptance Phase – Phase of construction after startup and initial checkout when functional performance tests, O&M documentation review and training occurs.

B. Acceptance Criteria – The criteria established by the Owner and design team which defines the specified requirements that a component or system must meet under all ranges of actual loads. The CxA's pre-functional inspections and functional testing determines if the acceptance criteria have been met.

C. Approval – Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.

D. Architect/Engineer (A/E) – The prime consultant (architect) and subconsultants who comprise the design team, generally the HVAC mechanical designer/engineer and the electrical designer/engineer.

E. Building Systems – The architectural, mechanical, electrical, plumbing and control systems along with their respective subsystems, equipment and components.

F. Basis of Design – The basis of design is the documentation of the primary thought processes and assumptions behind design decisions that were made to meet the owner's requirements. The basis of design describes the systems, components, conditions and methods chosen to meet the owner's requirements.

G. Commissioning – A quality control process that verifies that specified components and building systems have been installed, properly started up and then functionally tested to verify and document proper operation through all specified modes of operation and conditions, all of which shall perform in conformity with the owner's requirements. In addition, training of operations and maintenance personnel, identified by the owner, is verified, and final project operations and maintenance documents are reviewed for completeness.

H. Commissioning Authority – The owner's representative that verifies the commissioning process is properly carried out. The Commissioning Authority leads the commissioning process, executes the detailed planning and implementation of the commissioning process and makes final recommendations to the owner regarding the performance of the commissioned building systems. The Commissioning Authority is Genesys Engineering for this particular project.

I. Commissioning Plan – An overall plan, which provides the structure, schedule and coordination planning for the commissioning process.

J. Contract Documents – The documents binding on parties involved in the construction of the project (drawings, specifications, change orders, amendments, contracts, Cx Plan, etc.)

K. Control system – The central building energy management control system.

L. Controls Certification Form – A form provided by the CxA to the Prime Contractor which is intended to assist in assessing the progress of the installation and readiness of the systems for functional testing.

M. Datalogging – Monitoring flows, currents, status, pressures, etc., of equipment using standalone dataloggers separate from the control system.

N. Deferred Functional Tests – FTs that are performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions that prevent the test from being performed.

O. Deficiency – A condition in the installation or function of a component, piece of equipment or system that is not in compliance with the Contract Documents (that is, does not perform properly or is not complying with the design intent).

P. Design Narrative or Design Documentation – sections of either the Owners Project Requirements or Basis of Design.

Q. Factory Testing – testing of equipment on site or at the factory by factory personnel with or without an Owner's representative present. The PC furnishing the equipment is responsible for providing all testing documentation as per the contact documents.

R. Functional Performance Test (FT) – Test of the dynamic function and operation of equipment and systems using manual (direct observation) or monitoring methods. Functional testing is the dynamic testing of systems (rather than just components) under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint). Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all the control system's sequences of operation and components are verified to be responding as the sequences state. The Commissioning Authority develops the functional test procedures in a sequential written form, coordinates, oversees and documents the actual testing, which is performed in conjunction with the PC or vendor. FTs are performed after pre-functional inspections and startup is complete.

S. Functional Testing Procedures – The step-by-step process that must be executed to fulfill the functional testing requirements. The test procedures are developed by the CxA.

T. Functional Testing Summary – A listing of all tests that will be witnessed by the CxA during the testing process. These tests include startup, local testing, BMS point-to-point, BMS sequence testing, and performance testing.

U. Indirect Indicators – Indicators of a response or condition, such as a reading from a controls system screen reporting a damper to be 100% open.

V. Manual Test – Using hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation.")

W. Monitoring – The recording of parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of control systems.

X. Non-Compliance – See Deficiency.

Y. Non-Conformance – See Deficiency.

Z. Over-written Value – Writing over a sensor value in the control system to see the response of a system (e.g., changing the outside air temperature value from 50F to 75F to verify economizer operation.) See also Simulated Signal.

AA. Owner Contracted Tests – Tests paid for by the Owner outside the PC's contract and for which the CxA does not oversee. These tests will not be repeated during functional tests if properly documented.

BB. Operations and Maintenance (O&M) Manual – The document that records the information pertinent to the operations and maintenance of the components, equipment, subsystems, and systems for the building.

CC. Pre-functional Inspections (PFI) – Pre-functional inspections are primarily static inspections and procedures to prepare the equipment or system for initial operation. However, some pre-functional inspection items entail simple testing of the functionality of a component, a piece of equipment or system. The word pre-functional refers to before functional testing. Pre-functional inspections augment and are combined with the manufacturer's startup checklists. Even without a commissioning process, the PC typically performs some, if not many, of the pre-functional inspection items a Commissioning Authority will recommend. However, few PCs document in writing the execution or results of these inspected items.

DD. Prime Contractor (PC) – An organization whose role is to manage the construction team to build and test the building systems for the project. The Prime Contractor also works with the Commissioning Authority to coordinate and facilitate inspections and testing, and manage correction of any deficiencies.

EE. Project Manager (PM) – The contracting and managing authority for the owner over the design and/or construction of the project.

FF. Sampling – Performing PFIs or functionally testing only a fraction of the total number of identical or near identical pieces of equipment.

GG. Seasonal Performance Tests – FTs that are deferred until the system(s) will experience conditions closer to their design conditions.

HH. Simulated Condition – Condition that is created for the purpose of testing the response of a system (e.g., applying a hair blower to a space sensor to see the response in a VAV box).

II. Simulated Signal – Disconnecting a sensor and using a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate a sensor value.

JJ. Specifications – The construction specifications of the Contract Documents.

KK. Startup – The initial starting or activating of dynamic equipment, including executing pre-functional inspections.

LL. Trending – Monitoring using the building control system.

MM. Vendor – Supplier of equipment.

NN. Warranty Period – Warranty period for specific equipment and components. Warranties are defined in the appropriate sections of these specifications.

1.4 COORDINATION

A. Commissioning Team: The members of the commissioning team consist of the owner (SUNY New Paltz), Commissioning Authority (CxA), the owner's Project Manager (PM) and/or designated representative of the owner, the Prime Contractor (PC), and the architect and design engineers. The Owner's building or plant operator/engineer is also a member of the commissioning team

B. Management: The CxA directs and coordinates the commissioning activities and reports to the Owner and/or the PM. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

C. Scheduling: The CxA will work with the PM and/or PC according to established protocols to schedule the commissioning activities. The PC will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

1.5 COMMISSIONING PROCESS

A. Commissioning Plan: The Commissioning Plan will be provided by the CxA subsequent to contractor selection and will be binding on the PC. The Commissioning Plan is a dynamic document that will provide direction throughout the commissioning process. The plan puts a significant emphasis on defining roles and responsibilities and establishing communication protocols. The plan will be amended as the construction progresses to include updated schedules, pre-functional inspection items and functional testing procedures. The Specifications will take precedence over the Commissioning Plan.

B. Commissioning Process: The following narrative provides a brief overview of the typical commissioning tasks performed during construction and the general order in which they occur:

1. Commissioning during construction begins with a scoping meeting conducted by the CxA where the commissioning process is reviewed with the commissioning team members.
2. Additional meetings will be required throughout the construction, scheduled by the CxA with necessary parties attending, to plan, scope, coordinate, schedule future activities and resolve any problems.
3. Equipment documentation is submitted to the CxA during the normal submittals process including detailed start-up procedures.
4. The CxA works with the PC in reviewing and incorporating their startup plans and startup documentation into the pre-functional inspections and functional testing procedures.
5. In general, the checkout and performance verification proceeds from simple to complex; from component level to equipment to system and intersystem levels with pre-functional inspections being completed before functional testing.
6. The PC executes and documents the initial checkout, equipment start-up and certification that the equipment is ready for functional testing. If required by the CxA, this certification will be accomplished in a phased approach under the direction of the CxA. The CxA may witness the start-up of selected equipment.
7. The CxA develops specific equipment and system functional performance test procedures. The PC reviews and, if necessary, recommends modifications to the procedures.
8. The procedures are executed by the PC, under the direction of, and documented by the CxA.
9. Items of non-compliance in material, installation or setup are corrected at the PC expense and the system retested.
10. The CxA records the deficiencies and maintains a database detailing and tracking the correction of deficiencies identified during the Cx process and distributes these reports to the PC.
11. The CxA reviews the O&M documentation for completeness.
12. Commissioning is completed before acceptance.
13. The CxA reviews, and observes training provided by the PC and the manufacturer's services representatives and verifies that it was completed.
14. The CxA conducts deferred testing as specified or required.

1.6 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All of the following sections apply to the Work of this section. Trade specific commissioning responsibilities and reporting requirements are provided in the following sections:

Section 230800 – Commissioning of HVAC Systems
Section 260800 – Commissioning of Electrical Systems
Section 220800 – Commissioning of Plumbing Systems

1.7 RESPONSIBILITIES

A. The responsibilities of various parties in the commissioning process are provided in this section. It is noted that the services for the owner's Project Manager, Architect, HVAC mechanical and electrical designers/engineers and Commissioning Authority are not provided for in this contract. That is, the PC is not responsible for providing their services, and those responsibilities are listed here only for clarification of the commissioning process.

B. All Parties

1. Follow the Commissioning Plan.
2. Attend the commissioning scoping meeting and additional meetings as necessary.

C. Architect (A/E)

1. Construction and Acceptance Phase

a. Attend the commissioning scoping meeting and selected commissioning team meetings.
b. Understand and follow the Commissioning Plan.
c. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual preparation, etc., as contracted.
d. Provide the Basis of Design documentation.
e. Provide any design narrative documentation requested by the CxA.
f. Coordinate resolution of design non-conformance and design deficiencies identified during commissioning.
g. Prepare and submit final as-built design intent documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.

D. Mechanical and Electrical Designers/Engineers (A/E)

1. Construction and Acceptance Phase

a. Perform normal submittal review, construction observation, as-built drawing preparation, etc., as contracted. On site observation should be completed just prior to system startup.
b. Provide any design narrative and sequences documentation requested by the CxA. The designers shall assist (along with the PC) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
c. Attend commissioning scoping meetings and other selected commissioning team meetings.
d. Understand and follow the commissioning plan.

e. Participate in the resolution of system deficiencies identified during commissioning as necessary.
f. Prepare and submit the final as-built design intent and operating parameters documentation for inclusion in the O&M manuals. Review and approve the O&M manuals.
g. Participate in the resolution of non-compliance, non-conformance and design deficiencies identified during commissioning.

E. Commissioning Authority (CxA)

1. The CxA is not responsible for design concept, design criteria, compliance with codes, design or construction scheduling, cost estimating, or construction management. The CxA may assist with problem solving non-conformance or deficiencies, but ultimately that responsibility resides with the PC and A/E. The primary role of the CxA is to develop and coordinate the execution of the Commissioning Plan, observe and document system performance. Specifically, that the building systems are functioning in accordance with the documented design intent and in accordance with the Contract Documents. The PC will provide all tools or the use of tools to start, check-out and functionally test equipment and systems, except for specified testing with portable data-loggers, which shall be supplied and installed by the CxA.
2. Construction and Acceptance Phase

a. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
b. Coordinate the commissioning work with the PC and verify that commissioning activities are being scheduled into the master schedule.
c. Revise the Commissioning Plan as necessary.
d. Plan and conduct a commissioning scoping meeting.
e. Request and review additional information required to perform commissioning tasks, including O&M materials, PC start-up and checkout procedures.
f. Before startup, gather and review the current control sequences and interlocks and work with PC and design engineers until sufficient clarity has been obtained, in writing, to be able to write detailed testing procedures.
g. Write and distribute pre-functional inspections.
h. Perform pre-functional inspections by selected equipment inspections, site observation and spot-checking.
i. The CxA will provide the PC a list of the required submittals. The PC bears all costs associated with providing the requested submittals to the CxA without any additional cost to the Owner, CxA or others.
j. Perform site visits, as necessary, to observe component and system installations. Attends selected planning and job-site meetings to obtain information on construction progress. Review construction meeting minutes for revisions/substitutions relating to the commissioning process. Assist in resolving any discrepancies.
k. With necessary assistance and review from the PC, write the functional performance test procedures for equipment and systems. This may include energy management control system trending, stand-alone datalogger monitoring or manual functional testing.
l. Evaluate systems startup procedures by reviewing start-up reports and by selected site observation.
m. Review TAB execution plan.

n. Execute, with the assistance of the PC, functional testing of the control system before, or in conjunction with, the HVAC system TAB. Coordinate retesting as necessary until satisfactory performance is achieved.
o. Review air and water systems TAB by spot testing, by reviewing completed reports and by selected site observation after receiving the final TAB report.
p. Analyze any functional performance trend logs and monitoring data to verify performance.
q. Maintain a master deficiency and resolution log and a separate testing record. Provide the PC and PM with written progress reports and test results with recommended actions.
r. Witness selected training of the Owner's operating personnel.
s. Review the preparation of O&M manuals.
t. Provide a final commissioning report.
u. Coordinate and supervise required seasonal or deferred testing and deficiency corrections.

F. Owner's Project Manager (PM)

1. Construction and Acceptance Phase

a. Manage the contract of the A/E, PC and CxA.
b. Provide final approval for the completion of the commissioning work.
c. Assist with addressing any seasonal or deferred testing and any deficiency issues.

G. Prime Contractor (PC)

1. Construction and Acceptance Phase

a. Include the cost of supporting commissioning in the contract price.
b. Attend a commissioning scoping meeting and other commissioning team meetings.
c. Furnish a copy of all construction documents, addenda, change orders and submittals and shop drawings related to commissioned equipment to the CxA. The CxA will forward a request to the PC for copies of the submittals that the CxA would like to review. The PC bears all costs associated with providing the requested submittals to the CxA without any additional cost to the Owner, CxA or others.
d. Provide the requisite readiness notification for equipment pre-functional inspections and functional testing.
e. Coordinate, review and participate in startup and functional testing of all equipment, as directed by the CxA.
f. The PC should coordinate completion of the Controls Certification Form, prior to the start of functional testing, and return to the CxA in a timely manner.
g. Review the functional performance test procedures submitted by the CxA, prior to testing.
h. The PC should coordinate to provide the necessary passwords and system access to the BMS to allow the CxA to overwrite set points and other systems parameters. The access level should be at the highest level possible with the exception of allowing the CxA to modify the programming sequences.
i. Review commissioning progress and deficiency reports.
j. Coordinate the resolution of deficiencies identified by the CxA
k. Document the completion and/or action taken for the resolution of deficiencies as directed by the CxA and described in the Cx Plan utilizing forms provided by the CxA. These forms should be returned to the CxA within 10 working days of the date of distribution by the CxA.

l. Coordinate and perform the training of owner personnel. Notify the CxA when training will be taking place.
m. Prepare O&M manuals, according to the Contract documents, including clarifying and updating the original sequences of operation to as-built conditions.
n. Assist the CxA as necessary in the seasonal or deferred testing and deficiency corrections required by the specifications.
o. Correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.

H. Equipment Suppliers

1. Provide all requested submittal data, including detailed start-up procedures and specific responsibilities of the Owner to keep warranties in force.
2. Assist in equipment commissioning with PC as per the contract documents.
3. Include all special tools and instruments (only available from vendor, specific to a piece of equipment) required for testing equipment according to these Contract Documents in the base bid price to the PC.
4. Provide the information requested by the CxA regarding equipment sequences of operation and testing procedures.
5. Review test procedures for equipment installed by factory representatives.

1.8 SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned in this project. The Owner and the CxA reserves the right to amend this list at any time during the construction and acceptance process.

HVAC

1. Air Handling and Ventilation Systems
2. Pumps
3. General Exhaust System
4. Kitchen Make-Up and Exhaust System
5. Individual Temperature Controls
6. Water to Water Heat Pumps
7. Terminal Equipment – VAVs
8. BMS Controls
9. Glycol Make-Up Pump
10. Ductless Split System
11. Unit Heaters

Electrical

1. Lighting and Lighting Controls
2. Electrical Metering System

Plumbing

1. Plumbing Fixtures
2. Domestic Water Heater
3. Plumbing Metering

PART 2 - PRODUCTS

2.1 TEST EQUIPMENT

A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the PC for the equipment being tested.

B. Special equipment, tools, instruments, (only available from vendor, specific to a piece of equipment) required for testing equipment, according to these Contract Documents, shall be included in the base bid price and left on site, except for stand-alone datalogging equipment that may be used by the CxA.

C. Datalogging equipment and software required to test equipment will be provided by the CxA but shall not become the property of the Owner.

D. All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified in the Specifications.

PART 3 - EXECUTION

3.1 MEETINGS

A. Functional Performance Testing Meeting – The CxA will schedule, plan and conduct a functional performance test meeting with the entire commissioning team in attendance to kickoff the FT phase. Representatives from the PC as well as the automated controls vendor will be required to attend this meeting.

B. Miscellaneous Meetings – Progress meetings will be scheduled and conducted by the CxA, as necessary. Other meetings will be planned and conducted by the CxA as the construction progresses. These meetings will cover coordination, deficiency resolution and planning issues. The CxA will plan these meetings and will minimize unnecessary time being spent by PC.

3.2 REPORTING

A. The CxA will provide regular reports to the Owner, PM, PC, and A/E depending on the management structure, with increasing frequency as construction and commissioning progresses.

B. The CxA will regularly communicate with all members of the commissioning team, keeping them apprised for commissioning progress, and scheduling changes through memos, progress reports, etc.

C. Testing or review approvals and non-conformance and deficiency reports are made regularly with the review and testing as described in later sections.

D. A final summary report by the CxA will be provided to the Owner. The report will include:

1. A brief summary report that includes a list of participants and roles, brief building description, overview of commissioning and testing scope, and a general description of testing and verification methods. For each piece of commissioned equipment, the report

should contain the disposition of the CxA regarding the adequacy of the equipment, documentation, and training meeting the contract documents in the following areas:

a. Equipment meeting the equipment specifications
b. Equipment installation
c. Functional performance and efficiency
d. Equipment documentation
e. Operator Training

2. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to equipment and operations, future actions, recommended commissioning process changes, etc. shall also be listed.
3. Also included in the Commissioning Record shall be the issues log, commissioning plan, progress reports, O&M manual reviews, training record, test schedules, construction checklists, start-up reports, functional tests and trend log analysis.

3.3 SUBMITTALS

A. The CxA will provide the PC with a specific request for the type of submittal documentation the CxA requires to facilitate the commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. At a minimum the request will include the manufacturer and model number, the manufacturer's printed installation and detailed startup procedures, full sequences of operation, O&M data, performance data, any performance test procedures, control drawings and details of owner contracted tests. In addition, the installation and checkout materials that are actually shipped inside the equipment and the actual field checkout sheet forms to be used by the factory or field technicians shall be submitted to the CxA. All documentation requested by the CxA will be included by the PC in their O&M manual contributions.

B. The CxA will review submittals related to the commissioned equipment for conformance to the Contract Documents as it relates to the commissioning process, to the functional performance of the equipment and adequacy for developing test procedures. This review is intended primarily to aid in the development of functional testing procedures. The CxA will notify the Owner, PM, PC or A/E as requested, of items not provided or areas that are not in conformance with Contract Documents and which require resubmission. The CxA does not have approval responsibility.

C. The CxA may request additional design narrative from the A/E, depending on the completeness of the design intent documentation and sequences provided with the Specifications.

D. These submittals to the CxA do not constitute compliance for O&M manual documentation. The O&M manuals are the responsibility of the PC, though the CxA will review them.

E. The CxA shall receive a copy of the final approved submittals.

3.4 SYSTEM START-UP AND TESTING

A. General Requirements

1. All systems and system components shall be tested by the PC and in the presence of the Owner and Design Consultants if desired by the Owner and Design Consultants to demonstrate compliance with specified requirements. To minimize the time of commissioning, contracting, and Design Consultant team members, testing shall be done in seasonal single blocks of time insofar as possible.

2. All testing shall be conducted under specified design operating conditions as approved by the CxA and Design Consultants.
3. All elements of systems shall be tested to demonstrate that total systems satisfy all requirements of these Specifications. Testing shall be accomplished on a hierarchical basis. Each piece of equipment shall be tested for proper operation, and functionality of safety devices, followed by each system's subsystem, followed by the entire system, followed by any interlocks to other major systems.
4. All special testing materials and equipment shall be provided by the PC. This includes, but is not limited to, proprietary equipment, hand-held control parameter/setpoint adjustment tools, water/air flow balancing readout and adjustment tools.
5. One copy of all factory test reports and records as well as all start-up documentation shall be provided to the CxA.
6. A controls certification form will be provided to the PC prior to the start of functional testing. This form should be completed as required, and returned to the CxA. The purpose of this document is to assist the PC and CxA in assessing the progress and readiness of the systems for functional testing. In addition, this form is also used to determine if the controls have been programmed and sequenced in accordance with the design intent and specified sequence of operation.

B. Test Procedure Development and Test Documentation

1. At least fourteen (14) days prior to startup of the mechanical system, the PC shall inform the CxA, the Owner's representative and Design Consultants of the intention to start up the system.

C. Pre-functional Inspection Requirements

1. The CxA will provide the inspection forms for each system and equipment to evaluate completion of the installation and readiness for functional testing.
2. The CxA will check the equipment for proper installation to verify that it is ready to perform as specified.
3. Verification of complete and proper installation shall be completed prior to performing functional performance tests.

D. Equipment Startup

1. The PC or manufacturer's representative will be responsible for performing their own startup and checkout process. During this time the equipment is generally prepared in accordance with the manufacturer's recommendations.
2. The CxA will request certain tests be performed again, in the presence of the CxA after the original start-up and troubleshooting has been performed by the PC. Any manufacturer start-up testing that is performed does not relieve the PC of additional, and perhaps duplicative, tests as required for functional testing.

E. Functional Performance Testing Requirements

1. A functional performance test shall be performed on each complete system. Each function shall be demonstrated to the satisfaction of the CxA based on the written test procedure developed by the CxA to demonstrate conformance to the requirements of the Contract Documents.
2. Each functional performance test shall be performed, witnessed and signed off by the CxA. The PC will coordinate the proper parties to participate in functional testing. Any exceptions to this will be made clear to the Owner as to the reason and justification.

3. The functional performance testing shall be conducted in accordance with prior approved procedures and documented as required.
4. The PC shall notify the contracting team, the CxA, and Design Consultants, at least two weeks prior to the date of schedule functional performance tests. The seasonal functional performance test periods shall be scheduled over a single block of days. The schedule of functional performance tests shall be based on the construction completion schedule.

3.5 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Documentation – The CxA shall witness and document the results of all functional performance tests using the specific forms developed by the CxA for that purpose.

B. Non-Conformance:

1. The CxA will record the results of the functional tests utilizing the appropriate documentation. All deficiencies or non-conformance issues shall be noted and reported to the Owner, PM, PC, and A/E.
2. Reports of the deficiencies identified will be provided to the project team by the CxA. Individual forms identifying the deficiencies for each trade will also be provided. These forms are utilized for the PC to inform the CxA of the action taken to address the deficiency items and these forms must be returned within 10 working days to the CxA.
3. Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA. In such cases, the deficiency and resolution will be documented by the CxA.
4. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures. However, the CxA will not be pressured into overlooking deficient work or compromising acceptance criteria to satisfy scheduling or cost issues, unless there is an overriding reason to do so at the request of the Owner.
5. Cost of Retesting:

    a. The cost for the PC to repeat a pre-functional inspection or functional test shall be theirs.
    b. The time for the CxA to direct any retesting required because a specific pre-functional inspection of start-up test item, reported to have been successfully completed, but determined during functional testing to be faulty, will be back charged to the PC.

6. The PC shall respond in writing to the CxA at least as often as commissioning meetings are scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.

C. Failure Due to Manufacturer Defect or Improper Installation - If 10%, or three, whichever is greater, of identical pieces of equipment (size alone does not constitute a difference) fail to perform to the Contract Documents (either mechanically or substantively) due to manufacturing defect or improper installation, not allowing it to meet its submitted performance spec, all identical units may be considered unacceptable by the CxA, PM, A/E or Owner. In such case, the PC shall provide the Owner with the following:

1. Within one week of notification from the A/E (via the CxA), the PC or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CxA or PM within two weeks of the original notice.

2. Within two weeks of the original notification, the PC or manufacturer shall provide a signed and dated written explanation of the problem, cause of failures, etc., and all proposed solutions, which shall include full equipment submittals. The proposed solutions shall not significantly exceed the specification requirements of the original installation.
3. The CxA, PC and PM will determine whether a replacement of all identical units or a repair is acceptable.
4. Two examples of the proposed solution will be installed by the PC and the CxA will be allowed to test the installations for up to one week, upon which the CxA or PM will decide whether to accept the solution.
5. Upon acceptance, the PC and/or manufacturer shall replace or repair all identical items, at their expense, and extend warranty accordingly, if the original equipment warranty had begun. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

D. Approval – The CxA documents each satisfactorily demonstrated functional test.

3.6 OPERATION AND MAINTENANCE MANUALS

A. Standard O&M Manuals

1. The specific content and format requirements for the standard O&M manuals are detailed in the contract documents. Special requirements for the automated controls and the TAB are detailed in the contract documents.
2. Prior to substantial completion, the CxA shall review the O&M manuals, documentation and redline as-builts for systems that were commissioned to verify compliance with the specifications. The CxA will communicate deficiencies in the manuals to the PM, PC, A/E or Owner as requested. Upon successful review of the corrections, the CxA recommends approval and acceptance of these sections of the O&M manuals to the PM, PC, A/E and Owner. The CxA also reviews each commissioned equipment's warranty and verifies that all requirements to keep the warranty valid are clearly stated. This work does not supersede the A/E's review of the O&M manuals according to the A/E contract.

3.7 TRAINING OF OWNER PERSONNEL

A. The PC shall be responsible for training coordination and scheduling and for ultimately ensuring that training is completed. The PC shall inform the CxA when training will be scheduled.

B. In addition to these general requirements, the specific training requirements of Owner's personnel by PC, as detailed in the specifications, shall be provided.

C. The CxA develops criteria for determining that the training was satisfactorily completed, including attending some of the training.

3.8 DEFERRED TESTING

A. Unforeseen Deferred Tests – If any inspection or test cannot be completed due to the building structure, required occupancy condition or other deficiency, execution of inspections and functional testing may be delayed upon approval of the PM or Owner. These tests will be conducted in the same manner as the seasonal test as soon as possible. Services of necessary parties will be negotiated.

B. Seasonal Testing – During the warranty period, seasonal testing (tests delayed until weather conditions are closer to the system's design) shall be completed as part of this contract. The CxA shall coordinate this activity. Tests will be executed, documented and deficiencies corrected by the PC, with facilities staff and the CxA witnessing. Any final adjustments to the O&M manuals and as-builts due to the testing will be made.

3.9 WRITTEN WORK PRODUCTS

A. The commissioning process generates a number of written work products described in various parts of the specifications. The Commissioning Plan lists all the formal written work products, describes briefly their contents, who is responsible to create them, and who receives and approves them. In summary the written products are:

Product	Developed By
1. Final Commissioning Plan	CxA
2. Commissioning Schedules	CxA and PC
3. Equipment Documentation Submittals	PC
4. Sequence Clarifications	A/E and PC as needed
5. Pre-Functional Inspection Forms	CxA
6. Pre-Functional Inspections	CxA
7. Startup and Initial Checkout Plans	PC
8. Final TAB Report	PC
9. Commissioning Progress Record	CxA
10. Deficiency Reports	CxA
11. Functional Test Procedures	CxA
12. O&M Manuals	PC
13. Commissioning Record	CxA
14. Overall Training Plans	PC
15. Final Commissioning Report	CxA

END OF SECTION 01 91 13

SECTION 01 91 19 - BUILDING ENCLOSURE COMMISSIONING REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DESCRIPTION

A. Building Enclosure Commissioning is a systematic process of verifying that all building enclosure systems, including those listed in Article 1.8, perform interactively according to the Owner's operational needs, the design documents, manufacturer's recommendations, and good engineering, architectural, and workmanship practices. This is achieved by beginning in the design phase and understanding the Owner's requirements, and continuing through construction, acceptance, and the warranty period with actual verification of performance.

B. Building Enclosure Commissioning (BECx) is distinct from the mechanical, electrical, and plumbing commissioning (Cx). BECx is the process by which the designed and constructed performance of building enclosure materials, components, assemblies, and systems are validated and documented to meet defined objectives and requirements of the project, as established by the Owner.

C. This Section includes supplemental requirements for implementation of building enclosure commissioning of the components and assemblies of the building enclosure. This Section provides the requirements for the processes and responsibilities of BECx, while individual technical and equipment sections describe detailed requirements for quality assurance testing, preconstruction testing, mockups, submittals, pre-installation conferences, and field quality control for each division.

D. The enclosure commissioning process does not take away from or reduce the responsibility of the system designers or the installers to provide a finished and fully functioning product.

E. Abbreviations: The following are common abbreviations used in the Specifications. Definitions are found in Article 1.3.

A/E -	Architects and Design Engineers	PC -	Prime Contractor
BECxA -	Building Enclosure Commissioning Authority	OPR -	Owner's Project Requirements
CxA -	Commissioning Authority (mechanical systems)	PM -	Project Manager (of the Owner)
BOD -	Basis of Design		
CTR -	Enclosure Installers	BECA-	Building Enclosure Commissioning Agent
BECx -	Building Enclosure Commissioning	O&M -	Operation & Maintenance Manual
BECx Plan -	Building Enclosure Commissioning Plan Document	ITA -	Independent Testing Agency

1.3 DEFINITIONS

A. Architect/Engineer (A/E) – The prime consultant (architect) and subconsultants who comprise the design team.

B. Building Enclosure – The materials, components, systems, and assemblies intended to protect interior spaces from unconditioned spaces and the exterior environment, including walls, fenestration, roofing and roof openings, floors, ceilings, below-grade perimeter walls, slabs-on-grade and floor/ceiling assemblies separating interior zones with differing performance criteria.

C. Basis of Design – A written document that details the information necessary to accomplish the Owner's Project Requirements (OPR). It records through narrative the technical concepts, performance assumptions, decisions, and product selections that fulfill the requirements of the OPR. The project-specific BOD should be periodically updated during the design and construction phases as these items are changed and refined.

D. Building Enclosure Commissioning (BECx) – The process by which the design and constructed performance of building enclosure materials, components, assemblies, and systems are validated and documented to meet defined objectives and requirements of the project, as established by the Owner.

E. Building Enclosure Commissioning Agent (BECA) – The Prime Contractor. For the purposes of building enclosure commissioning the Prime Contractor shall assume the role, tasks, and responsibilities of the Building Enclosure Commissioning Agent. Note that per the Owner's Building Commissioning Guidelines, the Owner does not allow the Commissioning Authority and Commissioning Agent to be the same organization or person. The Building Enclosure Commissioning Agent shall assign a representative with expertise and authority to act on its behalf to participate in the commissioning process.

F. Building Enclosure Commissioning Authority (BECxA) – The Owner's representative who verifies the enclosure commissioning process is properly carried out. The BECxA leads the enclosure commissioning process, executes the detailed planning and implementation of the enclosure commissioning process, and makes final recommendations to the Owner regarding the performance of the commissioned building enclosure systems.

G. Building Enclosure Commissioning Plan (BECx Plan) – A document prepared by the BECxA that outlines the organization, schedule, allocation of resources, responsibilities and

documentation requirements of the BECx process. The plan puts a significant emphasis on defining roles and responsibilities and establishing communication protocols. The Specifications will take precedence over the BECx Plan if a conflict occurs.

H. Building Enclosure Commissioning Report – A summary prepared at the conclusion of the project of all BECx activities that occurred, including: issue logs (including resolution and unresolved items), meeting minutes, testing results and areas where testing was performed, remediation of problems encountered during construction, the final BECx plan, the final OPR and BOD, the installer and manufacturer warranties, and the Enclosure Systems Maintenance Manual.

I. Building Enclosure Systems Maintenance Manual – A manual which includes an overview of the enclosure systems, as-built drawings, maintenance and inspection requirements and schedule, training requirements for the building staff, and replacement schedule.

J. Construction Checklists – Enclosure system checklists prepared by the BECxA and used by the Enclosure Installer prior to and during enclosure construction.

K. Contract Documents – The documents binding parties involved in the construction of the project (drawings, specifications, change orders, amendments, contracts, etc.)

L. Enclosure Installer(s) (CTR) – The company(s) engaged by the Owner or PC to provide and/or install building enclosure systems in accordance with the contract specifications, drawings, manufacturer's recommendations and good engineering and workmanship practices.

M. Independent Testing Agency (ITA) – The company(s) engaged by the Owner or PC to provide independent testing required for regulatory compliance and/or to verify installation or construction conforms to industry standards.

N. Issues Log – A log maintained by the BECxA, tracking all enclosure-related issues in conflict with the BOD or Construction Documents.

O. Ongoing Enclosure Commissioning Plan – A document developed by the BECxA, consisting of recommendations to be implemented over the service life of the structure, to re-establish enclosure-related durability, integration, and performance to a level consistent with the OPR, BOD, and Contract Documents.

P. Operations and Maintenance (O&M) Manual – The document that records the information pertinent to the operations and maintenance of the components, equipment, subsystems, and systems for the building enclosure. For the purpose of the enclosure commissioning, the O&M Manual is the Building Enclosure Systems Maintenance Manual.

Q. Owner's Project Requirements (OPR): A written document that details the Owner's vision and requirements of a project, and the expectations of how it will be used and operated. The OPR includes the programmatic and general performance requirements of a building, structure or portion thereof and the expectations of the Owner relative to its intended use, occupancy, operation, and service life. The project-specific OPR should be periodically updated during the design and construction phases as these requirements are changed and refined.

R. Pre-functional Inspection – BECxA confirms the pre-construction portions of the enclosure construction checklists have been completed.

S. Prime Contractor (PC) – An organization whose role is to manage the construction team and

various installers to build and test the building systems for the project. The Prime Contractor also works with the BECxA to identify and correct any deficiencies.

T. Project Manager (PM) – The contracting and managing authority for the Owner over the design and/or construction of the project.

U. Seasonal Testing – Performance verification testing that is deferred until the enclosure system(s) will experience conditions closer to their design conditions.

V. Specifications – The construction specifications of the Contract Documents.

W. Warranty Period – Warranty period for specific enclosure components. Warranties are defined in the appropriate sections of these specifications.

1.4 COORDINATION

A. Commissioning Team: The members of the commissioning team consist of:

1. Owner – SUNY New Paltz
2. Building Enclosure Commissioning Authority (BECxA).
3. Commissioning Authority (CxA).
4. Owner's Project Manager (PM) and/or designated representative of the Owner.
5. Prime Contractor (PC).
6. Enclosure Installer(s) (CTR).
7. Architect and design engineers (A/E).
8. Architect's enclosure consultant(s).
9. Enclosure manufacturer representatives.
10. Suppliers of materials.
11. Owner's building operator/engineer.
12. LEED consultant.

B. Management: The BECxA is retained by the Owner and/or CxA. The BECxA directs and coordinates the commissioning activities and reports to the A/E, Owner and/or the PM. All members work together to fulfill their contracted responsibilities and meet the objectives of the Contract Documents.

C. Scheduling: The BECxA will work with the PM and/or PC according to established protocols to schedule the commissioning activities. The PC will integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner to expedite the commissioning process.

1.5 COMMISSIONING PROCESS

A. Building Enclosure Commissioning Process: The following narrative provides a brief overview of the typical commissioning tasks performed before, during, and after construction and the general order in which they occur:

1. Prior to start of construction, the BECxA prepares the outline of the Enclosure Systems Maintenance Manual (the enclosure equivalent of an O&M Manual).
2. The BECxA develops the Building Enclosure Commissioning Plan. The plan details

the specific enclosure commissioning tasks and processes necessary to achieve the intent of the OPR and construction documents.

3. The BECxA documents the facility maintenance personnel enclosure training requirements as established by the Owner and issues the training requirements to the Prime Contractor through the outline of the Enclosure Systems Maintenance Manual.
4. The BECxA issues construction checklists to the PC and Enclosure Installers.
5. The BECx Scoping Meeting is held, at least 2 months prior to the start of enclosure construction.
6. The BECx Kickoff Meeting is held, prior to the start of enclosure construction.
7. As construction starts, pre-functional inspections are performed by the BECxA by confirming that the pre-construction checklist items have been completed for each enclosure system or material.
8. Performance verification testing of the enclosure elements and mock-ups are performed by the Prime Contractor or Owner's ITA as work proceeds, and the BECxA observes.
9. The BECxA reviews selected shop drawings and product data submittals related to the building enclosure, concurrently with the A/E. The A/E incorporates the BECxA comment into their own review as needed. The submittals required for concurrent review will be those deemed important by the BECxA for inspection and testing purposes.
10. The Enclosure Installer(s) complete the construction checklists under the oversight of the PC, and issues them to the BECxA regularly for review.
11. The BECxA performs enclosure construction observation at an interval established by the Owner and develops and updates an Issues Log.
12. Regular enclosure commissioning meetings are held on site, where construction checklists and new issues on the Issues Log are reviewed.
13. At conclusion of construction, the BECxA compiles all enclosure commissioning documents into the Final Enclosure Commissioning Report.
14. The BECxA confirms that the training plan has been implemented.
15. The BECxA compiles the final Enclosure Systems Maintenance Manual based on information provided by the PC and A/E.
16. The BECxA, A/E, Owner, PC, and Enclosure Installer(s) participate in the 10-month post-occupancy review/walkthrough of the project to examine the condition of the enclosure systems prior to the end of the Prime Contractor's warranty period.
17. The BECxA develops the Ongoing Enclosure Commissioning Plan with recommendations as required to re-establish enclosure-related durability, integration, and performance to a level consistent with the original OPR, BOD, and Contract Documents.

1.6 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All of the following sections apply to the Work of this section. Trade specific commissioning responsibilities and reporting requirements are provided in the following sections:

Section 019113 – General Commissioning Requirements
Section 240100 – Commissioning Requirements

1.7 RESPONSIBILITIES

A. The responsibilities of various parties in the enclosure commissioning process are provided in this section. Further specific responsibilities, when required, for the Building Enclosure Materials Manufacturers' technical representatives and Independent Testing Laboratory are described in their particular contract specifications and documents. It is noted that the services for the Owner's Project Manager, Architect, Architect's Enclosure Subconsultants, and Enclosure Commissioning Authority are not provided for in this contract. That is, the Prime Contractor is not responsible for providing their services, and those responsibilities are listed here only for clarification of the commissioning process.

B. All Parties

1. Follow the Commissioning Plan.

2. Attend the enclosure commissioning kickoff meeting and additional meetings as necessary.

C. Architect (A/E) and/or Architect's Enclosure Subconsultants

1. The following BECx Requirements are presented to clarify the A/E's responsibilities for BECx during the construction phase. Additional BECx tasks are performed by the A/E during the design phase.

   a. Attend the BECx Scoping Meeting and BECx Kickoff Meeting.
   b. Understand and follow the BECx Plan.
   c. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual preparation, etc., as contracted. Review and incorporate BECxA review comments as needed for enclosure-related shop drawing and submittal reviews.
   d. Provide the Basis of Design documentation.
   e. Provide any design narrative documentation requested by the BECxA.
   f. Attend pre-installation meetings for each enclosure trade.
   g. Review enclosure mockups, and ensure modifications made to mockup configurations are documented.
   h. Attend reoccurring BECx meetings during the enclosure construction phase.
   i. Coordinate resolution of design non-conformance and design deficiencies identified during commissioning.
   j. Address items identified on the Issues List related to clarification of design intent.
   k. Coordinate with the BECxA in revising the OPR and BOD as necessary throughout construction.

D. Building Enclosure Commissioning Authority (BECxA)

1. The BECxA is not responsible for design concept, design criteria, compliance with codes, design or construction scheduling, cost estimating, or construction management. The BECxA may assist with problem solving non-conformance or deficiencies, but ultimately that responsibility resides with the PC, CTR, and A/E. The primary role of the BECxA is to develop and coordinate the execution of the BECx Plan, observe and document enclosure system performance. Specifically, that enclosure systems are provided and installed in accordance with the documented design intent and in accordance with the Contract Documents.

2. The following BECx Requirements are presented to clarify the BECxA's responsibilities during the construction and occupancy phases.

   a. Coordinates and directs the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications and consultations with all necessary parties, frequently updated timelines and schedules and technical expertise.
   b. Coordinate the enclosure commissioning work and, with the PC and CTRs, verify that commissioning activities are being scheduled into the master schedule.
   c. Develop the BECx Plan prior to start of construction.
   d. Prepare the Enclosure Systems Maintenance Manual outline prior to start of construction.
   e. Document the enclosure systems maintenance training requirements prior to start of construction.
   f. Plan and conduct the BECx Scoping Meeting where long lead-time issues and BECx scope issues are addressed.
   g. Plan and conduct the BECx Kickoff Meeting where functional performance test procedures are reviewed along with the overall BECx process.
   h. Issue enclosure construction checklists to the PC and Enclosure Installer for each enclosure system.
   i. Perform pre-functional inspections by confirming the pre-construction portions of the enclosure construction checklists have been completed.
   j. Perform enclosure-related shop drawing and submittal reviews concurrently with the A/E. Provide comments to the A/E to implement.
   k. Issue the Owner's enclosure maintenance training requirements to the PC, to be incorporated into the Enclosure Systems Maintenance Manual.
   l. Review enclosure construction checklists periodically as they are provided by the PC and CTR.
   m. Review enclosure system mockups, and verify modifications made to mockup configurations are documented.
   n. Attend the pre-installation meeting for each building enclosure trade.
   o. Observe a representative portion of the building enclosure performance verification testing.
   p. Develop and maintain the Issues Log.
   q. Perform construction observation at frequency established by the Owner, and provide construction observation reports.
   r. Hold reoccurring BECx meetings during the enclosure construction phase.
   s. Review the Enclosure Installer's completed enclosure construction checklist for each enclosure trade.
   t. After the construction phase, complete the Enclosure Commissioning Report.
   u. Compile documents provided by the PC and A/E into the Enclosure Systems Maintenance Manual.
   v. Verify that the enclosure maintenance training plan has been implemented.
   w. Participate in the 10-month review/walkthrough of the project to examine the condition of the enclosure systems prior to the end of the Prime Contractor's warranty period.
   x. Coordinate with the electrical/mechanical CxA for seasonal performance testing.

E. Owner's Project Manager (PM)

1. The following BECx Requirements are presented to clarify the Owner's responsibilities during the construction and occupancy phases.

a. Manage the contract of the A/E, PC and BECxA.
b. Assist in scheduling and coordinating BECx activities.
c. Attend BECx meetings.
d. Review BECx reports and checklists.
e. Provide direction to address issues on the Issues Log when applicable.
f. Provide final approval for the completion of the enclosure commissioning work.
g. Address any seasonal or deferred testing and any deficiency issues.

F. Prime Contractor (PC)

1. The following BECx Requirements are presented to supplement the full range of responsibilities placed on the PC by the Contract Documents. The PC is responsible to ensure the Enclosure Installers and manufacturers perform their required tasks.

a. Include the cost of supporting enclosure commissioning in the contract price.
b. Schedule and attend the BECx scoping meeting and BECx kickoff meeting in coordination with the BECxA.
c. Furnish a copy of all construction documents, addenda, change orders and submittals and shop drawings related to the enclosure systems to the BECxA. The BECxA will forward a request to the PC for copies of the submittals that the BECxA is required to review concurrently with the A/E as required by the LEED guidelines. The Prime Contractor bears all costs associated with providing the requested submittals to the BECxA without any additional cost to the Owner, BECxA or others.
d. Coordinate completion of the pre-construction portions of enclosure construction checklists by the CTR prior to starting construction of a specific enclosure system.
e. Provide coordination for performance and review of enclosure system mockups, and ensure modifications made to mockup configurations are documented.
f. Provide coordination and access to allow the BECxA to observe enclosure construction in progress.
g. Include the BECx program into the scheduled pre-installation meeting for each building enclosure trade.
h. Schedule and coordinate building enclosure performance verification testing.
i. Attend reoccurring BECx meetings during the enclosure construction phase.
j. Review commissioning progress and deficiency reports.
k. Coordinate the resolution of deficiencies by the CTR, identified by the BECxA in the Issues Log.
l. Ensure that resolutions to deficiencies are documented and necessary adjustments to as-built documents are made by the CTR.
m. During construction of each enclosure material system, ensure the CTR updates the enclosure construction checklist and return to BECxA periodically, and at completion of work.
n. At completion of work, provide to the BECxA the information needed to complete Enclosure Systems Maintenance Manual and BECx Report, including warranties, manufacturer's product data and maintenance requirements, and any other information necessary for the operations and maintenance of the building enclosure, including clarifying and updating the original construction documents to depict as-built conditions.
o. Coordinate and perform the training of Owner personnel. Notify the BECxA when training will take place.
p. Participate in the 10-month review.

G. Enclosure Installers (CTR)

1. The following BECx Requirements are presented to supplement the full range of responsibilities placed on the Enclosure Installer by the Contract Documents. The Enclosure Installer is also responsible to ensure the sub-installers and manufacturers perform their required tasks.

    a. Include the cost of supporting enclosure commissioning in the contract price.
    b. Attend the BECx scoping meeting and BECx kickoff meeting.
    c. Complete pre-construction portions of enclosure construction checklists and return to the PC and BECxA prior to starting construction of a specific enclosure system.
    d. Construct enclosure system mockups, and document modifications made to the mockup configuration for implementation on the constructed enclosure.
    e. Provide coordination and access to allow the BECxA to observe enclosure construction in progress.
    f. Include the BECx program into the scheduled pre-installation meeting for each building enclosure trade.
    g. Schedule, coordinate, and perform (as applicable) building enclosure performance verification testing.
    h. Attend reoccurring BECx meetings during the enclosure construction phase.
    i. Review commissioning progress and deficiency reports.
    j. Resolve deficiencies identified by the BECxA in the Issues Log.
    k. Document resolutions to deficiencies and make necessary adjustments to as-built documents.
    l. During construction of each enclosure material system, update the enclosure construction checklist and return to PC and BECxA periodically, and at completion of work.
    m. Coordinate and perform the training of Owner personnel.
    n. Participate in the 10-month review.

1.8 SYSTEMS TO BE COMMISSIONED

A. The following enclosure systems will be commissioned in this project. The Owner and the BECxA reserves the right to amend this list at any time during the construction and acceptance process.

1. Cast-in-place concrete as applicable to the enclosure (e.g. water stops, reglets, anchor slots, preparation as substrate for waterproofing, slope for drainage), (Section 033000).

2. Unit masonry (e.g. CMU backup for exterior walls, brick masonry, anchors and ties, joint accessories, preparation of substrate for air barrier, flashing, brick cavity accessories); (Section 042000).

3. Building Insulation (Section 072100).

4. Vapor Retarder Under Slabs on Grade (Section 072600).

5. Metal Wall Panels (Section 074213).

6. Flashing and Trim; Built-In Flashings (Section 076200).

7. Joint sealers (Section 079200).

8. Storefronts, entrances, glass and glazing, and associated transitions and accessories (Sections 084000, 083113, 085113, and 084001).

PART 2 - PRODUCTS – NOT USED

PART 3 - EXECUTION

3.1 MEETINGS

A. BECx Scoping Meeting: A minimum of two months prior to the start of enclosure work, the BECxA shall hold a BECx Scoping Meeting with the Owner, A/E, PC, and Enclosure Installers. This scoping meeting is intended to discuss the BECx processes and address long lead-time issues such as preconstruction testing, mockup and sample panel construction, and submittal reviews. Information gathered from this meeting will allow the BECxA to revise the Commissioning Plan to its final version, which will also be distributed to all parties.

B. BECx Kickoff Meeting: Prior to the start of enclosure work, the BECxA shall hold a kickoff meeting with the Owner, PM, A/E, PC, Enclosure Installers, Building Enclosure Materials Manufacturers' technical representatives, and Independent Testing Laboratory. This kickoff meeting is to discuss the objectives of the BECx process, the roles and responsibilities of each team member, submittals, mock ups, construction sequencing, constructability, BECx documentation process, field observations, field performance testing activities (including repair and re-testing), project schedule, issues log, and other issues designated pertaining to project coordination, document control, and construction and validation of the building enclosure.

C. Pre-Installation Meetings for Each Trade: During the pre-installation meeting associated with each building enclosure trade, BECx-related tasks and responsibilities shall be reviewed, including coordination of the trades, approved shop drawings, sequence of construction, the testing of components and systems, QC/QA processes, schedule, and any observed conflicts with the submittals.

D. Reoccurring BECx Meeting: The BECxA, Owner or PM, A/E, PC, and Enclosure Installers shall participate in regularly scheduled site progress meetings held every two weeks for the duration of field construction of the building enclosure. The commissioning team shall review and discuss construction observations, the issues log, submittal review items, construction checklists, and the updated schedule for building enclosure installation, QA/QC audits, first level field testing, and field performance testing of installed systems.

3.2 REPORTING

A. The BECxA will provide regular reports to the Owner, CxA, PC, and A/E depending on the management structure, with increasing frequency as construction and commissioning progresses.

B. The BECxA will regularly communicate with all members of the commissioning team, keeping them apprised for commissioning progress, and scheduling changes through memos, progress reports, etc.

C. A final building enclosure commissioning report by the BECxA will be provided to the Owner. The report will include:

1. A brief summary report that includes a list of participants and roles, brief building description, overview of enclosure commissioning and testing scope, and a general description of testing and verification methods. For each piece of commissioned system, the report should contain the disposition of the BECxA regarding the adequacy of the system, documentation, and training, in general agreement with the contract documents in the following areas:

   a. Enclosure systems meeting the system specifications
   b. Enclosure system installation
   c. Functional performance
   d. Enclosure systems documentation
   e. Operator Training

2. All outstanding non-compliance items shall be specifically listed. Recommendations for improvement to window washing equipment and operations, future actions, recommended commissioning process changes, etc. shall also be listed.
3. Also included in the Final Building Enclosure Commissioning Report shall be the issue logs (including resolution and unresolved items), meeting minutes, testing results and areas where testing was performed, remediation of problems encountered during construction, the final BECx plan, the final OPR and BOD, the installer and manufacturer warranties, and the Enclosure Systems Maintenance Manual.

D. The BECxA will compile an enclosure systems maintenance manual that will consists of the following:

1. Overview of the enclosure systems

2. As-built drawings

3. Maintenance and inspection requirements and schedule

4. Training requirements for the building staff

5. Replacement schedule

6. Instructions for operation of window washing equipment for emergencies, startup and shutdown

3.3 SUBMITTALS

A. The BECxA will provide the PC with a specific request for the type of submittal documentation the BECxA requires to facilitate the enclosure commissioning work. These requests will be integrated into the normal submittal process and protocol of the construction team. All documentation requested by the BECxA will be included by the CTRs in their O&M manual contributions.

B. The BECxA will review submittals related to the commissioned systems for conformance to the OPR and BOD, to Contract Documents, to the functional performance of the systems, and to the adequacy for developing test procedures. The BECxA will notify the Owner, CxA, PC or A/E as requested, of items not included or areas that are not in conformance with Contract Documents and which require resubmission. The BECxA does not have approval responsibility, but is required to review the submittals concurrently with the design team as it may be required by LEED guidelines.

C. The BECxA may request additional design narrative from the A/E and Enclosure Installer(s), depending on the completeness of the design intent documentation and sequences provided with the Specifications.

D. The BECxA shall review the submittals once. The BECxA shall receive a copy of the final approved submittals.

3.4 CONSTRUCTION CHECKLISTS:

A. Construction checklists are prepared by the BECxA and used by the Enclosure Installer to verify that the building enclosure components are installed in compliance with the project specifications, the manufacturer's installation instructions, and industry best practices.

B. Each of the building enclosure systems require a separate checklist for installation. These checklists are to be reviewed by the Owner or PM, A/E, PC, and Enclosure Installer, with input from the enclosure product manufacturer, facility manager, and O&M staff (as applicable). The checklists should be reviewed and finalized at the pre-installation meeting for each building enclosure trade/component and submitted by the Prime Contractor at regular intervals throughout installation of the enclosure trade/component.

C. Checklists shall have a preliminary section for pre-construction verification of items, such as submittals (product data, shop drawings, compatibility certificates, qualification data, etc.), as well as confirming the pre-installation conference, examination of unique conditions and material interfaces, any required pre-construction field testing, and scheduling of inspectors.

D. The installation portion of the checklist shall cover items such as storage, surface preparation, installation procedures, cleaning, protection, testing, and warranty inspections.

3.5 DOCUMENTATION, NON-CONFORMANCE AND APPROVAL OF TESTS

A. Issues Log:

1. Issues logs are generated to document deviations from the contact documents, conflicts in the submittals, and performance issues in conflict with the OPR. The issues log is to be prepared by the BECxA and reviewed by the PM or Owner. The log will be introduced to the construction team at the pre-construction BECx kickoff meeting and used by the A/E, PC, Enclosure Installers, and enclosure testing companies. The issues log should be reviewed and updated at progress meetings (preferably weekly), BECx team meetings, and during BECxA site visits.

2. The BECxA does not approve or reject work by the Prime Contractor. The issues generated by the BECxA in the Issues Log are presented for consideration by the Commissioning Team.

3. Issues can be removed from the active Issues Log by the BECxA by the following methods, as applicable:

   a. The Prime Contractor or Enclosure Installer corrects the non-compliance.
   b. The Prime Contractor or Enclosure Installer provides additional documentation indicating compliance with construction documents.
   c. The A/E provides design clarification.
   d. The A/E accepts the discrepancy or potential issue.
   e. The PM or Owner accepts the discrepancy or potential issue.

f. Other methods of resolution proposed by the Commissioning Team.

4. The Prime Contractor shall respond in writing to the BECxA at least as often as enclosure commissioning meetings are scheduled concerning the status of each apparent outstanding discrepancy identified during commissioning. Discussion shall cover explanations of any disagreements and proposals for their resolution.

5. The issues log shall include:

a. Unique numbering system for each issue
b. Detailed description
c. The initial observer
d. Date
e. Enclosure system impacted
f. Location of issue
g. Responsible party
h. Reference to the applicable Contract Documents
i. Resolution description, status, and date, including any testing performed to verify resolution
j. If any Owner-accepted deviations are made to the CDs or BOD to resolve an issue, these should be documented formally.

B. Documentation – The BECxA shall witness and document the results of a portion of the field performance verification testing, as defined in the BECx Plan. The BECxA does not approve or reject the systems verified based on the observed testing, but will advise the PM/Owner and A/E.

3.6 PERFORMANCE VERIFICATION TESTING

A. Quality Assurance and Control: enclosure-related performance verification testing, quality-assurance, and quality-control requirements for individual building envelope systems and materials, methods, and assemblies are specified in the technical specification sections relating to those activities. Additional specified BECx tests, inspections, and related actions are specified in this section, but do not limit Prime Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.

B. Costs associated with re-testing caused by failure of the performance verification testing, during mock-up or construction phase work, shall be the responsibility of the Prime Contractor.

3.7 TRAINING OF OWNER PERSONNEL

A. The PC shall be responsible for training coordination and scheduling and for ultimately ensuring that training is completed. The PC shall inform the BECxA when training will be scheduled.

B. The BECxA shall be responsible for overseeing and approving the content and adequacy of the training of the Owner personnel.

C. The BECxA shall interview the facility manager and lead engineer to determine the special needs and areas where training would be most valuable. The Owner and CxA shall decide how rigorous the training should be for each piece of commissioned enclosure system.

D. In addition to these general requirements, the specific training requirements of Owner's personnel by CTRs, as detailed in the specifications, shall be provided.

E. Each CTR and vendor responsible for training will submit a written training plan to the BECxA, for review and approval prior to training. The plan will cover the following elements:

1. Equipment or system (included in training)
2. Intended audience
3. Location of training
4. Objectives
5. Subjects covered (description, duration of discussion, special methods, etc.)
6. Duration of training on each subject
7. Instructor for each subject and qualifications
8. Methods (classroom lecture, video, site walk-through, actual demonstrations, etc.)

F. The BECxA develops criteria for determining that the training was satisfactorily completed, including attending some of the training.

3.8 WRITTEN WORK PRODUCTS

A. The BECx process generates a number of written work products described in various parts of the specifications. The BECx Plan lists all the formal written work products, describes briefly their contents, who is responsible to create them, and who receives and approves them. In summary the written products are:

Product	Developed By
1. Owner's Project Requirements (OPR) for the Enclosure	Owner and BECxA
2. Basis of Design (BOD) for the Enclosure	A/E and BECxA
3. Building Enclosure Commissioning Plan	BECxA
4. Enclosure Material Submittals	CTR
5. Shop Drawing Submittals with A/E and BECxA Comments	CTR
6. Enclosure Warranties	CTR
7. Checklists (Pre-Functional Inspection and Construction Checklists)	Generated by BECxA and implemented by PC and CTR
8. BECx Construction Observation Reports	BECxA
9. Building Enclosure Systems Maintenance Manual (O&M Manual)	BECxA, based on information provided by PC and A/E
10. Performance Verification Testing Reports	ITA, CTR

11. Issues Log	BECxA
12. Final Building Enclosure Commissioning Report	BECxA
13. Ongoing Enclosure Commissioning Plan	BECxA

END OF SECTION 03 13 19

SECTION 02 41 19 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Demolition and removal of selected portions of building or structure.
   2. Demolition and removal of selected site elements.
   3. Salvage of existing items to be reused or recycled.

B. Related Requirements:
   1. Section 011100 "General Requirements" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
   2. Section 015639 "Temporary Tree and Plant Protection" for temporary protection of existing trees and plants that are affected by selective demolition.
   3. Section 017300 "Execution" for cutting and patching procedures.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.3 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
   1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Engineering Survey: Submit engineering survey of condition of building.

C. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property. Indicate proposed locations and construction of barriers.

D. Schedule of Selective Demolition Activities: Indicate the following:
   1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's [building manager's] [and] [other tenants'] on-site operations are uninterrupted.
   2. Interruption of utility services. Indicate how long utility services will be interrupted.
   3. Coordination for shutoff, capping, and continuation of utility services.
   4. Use of elevator and stairs.
   5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

E. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by salvage and demolition operations. Comply with Section 013233 "Photographic Documentation." Submit before Work begins.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

G. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

1.5 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

1.6 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.7 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. Hazardous materials will be removed by Owner before start of the Work.
   2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Hazardous Materials: Present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is on file for review and use. Examine report to become aware of locations where hazardous materials are present.
   1. Hazardous material remediation is specified elsewhere in the Contract Documents.
   2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.
   3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.

F. Storage or sale of removed items or materials on-site is not permitted.

G. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.9 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS (Not Used)

2.1 PERFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSP A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review Project Record Documents of existing construction or other existing condition and hazardous material information provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in Project Record Documents.

C. Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
   1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

D. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

E. Verify that hazardous materials have been remediated before proceeding with building demolition operations.

F. Survey of Existing Conditions: Record existing conditions by use preconstruction photographs or video.
   1. Inventory and record the condition of items to be removed and salvaged.
   2. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 PREPARATION

A. Refrigerant: Before starting demolition, remove refrigerant from mechanical equipment according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
   2. Arrange to shut off utilities with utility companies.
   3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
      a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
      b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
      c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
      d. d.Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
      e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
      f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
      g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
   1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
   2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
   3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
   4. Cover and protect furniture, furnishings, and equipment that have not been removed.
   5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."

B. Temporary Shoring: Design, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
   1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
   2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
   3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
   4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
   5. Maintain fire watch during and for at least an hour after flame-cutting operations.
   6. Maintain adequate ventilation when using cutting torches.
   7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
   8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
   9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
   10. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

C. Removed and Salvaged Items:
   1. Clean salvaged items.
   2. Pack or crate items after cleaning. Identify contents of containers.
   3. Store items in a secure area until delivery to Owner.
   4. Transport items to Owner's storage area on-site.
   5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:
   1. Clean and repair items to functional condition adequate for intended reuse.
   2. Pack or crate items after cleaning and repairing. Identify contents of containers.
   3. Protect items from damage during transport and storage.

4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."

F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section 075323 “Ethylene-Propylene-Diene-Monomer (EPDM) Roofing” for new roofing requirements.
   1. Remove existing roof membrane, flashings, copings, and roof accessories.
   2. Remove existing roofing system down to substrate.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction, and recycle or dispose of them according to Section 017419 "Construction Waste Management and Disposal."
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
   3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
   4. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

SECTION 02 82 13- ASBESTOS ABATEMENT

Asbestos

The following shall apply to the abatement of asbestos being done under this contract:

a. Applicable Regulations: All work to be done under this Contract shall be in compliance with Part 56 of Title 12 of the Official Compilation of Codes, Rules and Regulations of the State of New York (cited as 12 NYCRR Part 56), as currently amended, and applicable federal and state regulations.

b. Presumed Asbestos-Containing Material: During any work of this contract that disturbs existing material, all material that can be defined as "presumed asbestos-containing material" according to 29 CFR Part 1926 **and guidance documents published by New York State Department of Health's (NYSDOH) Environmental Laboratory Approval Program (ELAP) and Bureau of Occupational Health (BOH), and the NYS Department of Labor (DOL)** shall be considered asbestos-containing materials unless asbestos test results bound at the end of this section indicated otherwise; or if the Contractor, at its own expense, tests the presumed asbestos-containing material and rebuts the presumption, as permitted by 29 CFR Part 1926.

c. Applicable Variance: During the performance of the work, comply with the requirements of variance(s), if any, obtained by the Owner and/or consultant, which are bound after this section. The Contractor is responsible for the cost and the time required to obtain any additional variance(s) that they deem desirable in the performance of the work and feel may be consistent with the policies/ procedures as set forth in 12 NYCRR Part 56. **Prior to requesting any additional variance(s), submit a draft(s) of the request to the Consultant and the Fund for review and approval.** Copies of all additional variance(s) obtained by the Contractor shall be provided to the Consultant, Fund and the Campus prior to performing any work affected by the additional variance(s).

d. Owner Project Fact Sheet: The Contractor shall complete and submit three copies of the Asbestos Material Fact Sheet (appended to this Section) to the Fund prior to the project startup. If the initial submission is not complete for a reason approved by the Fund, the complete Asbestos Material Fact Sheet shall be submitted prior to acceptance of the applicable work.

e. Air Monitoring: The Owner shall be responsible for hiring and paying an independent third party firm to perform the requirements of air monitoring as called for in 12 NYCRR Part 56 and as permitted in Section 2.17 of the Agreement. The Owner's air monitoring firm shall provide 24 hour turn around on tests, will work during the hours between 7 AM and 4

PM on Monday through Friday unless otherwise agreed to by the Owner, and may inspect the work for cleanliness prior to performing sampling. Cooperate with the Owner's air monitoring firm in sequencing and scheduling the work in concert with the air monitor's availability. Provide access, electrical power and lighting, cleaning, and other work required to facilitate successful air monitoring activities. Provide additional air monitoring, at no expense to the Owner, as required to protect and monitor on site workers if required by applicable safety regulation or the contractor's safety plan.

f. Disposal Procedures: It is the responsibility of the Contractor to determine and comply with the waste handling, transportation and disposal regulations in effect at the time the work is performed, as applicable to the work site(s) and proposed waste disposal facility/landfill(s). The asbestos contractor must comply fully with the latter regulations and all other applicable U.S. Department of Transportation, Environmental Protection Agency (EPA), and other Federal, State and local rules and regulations in effect at the time the work is performed. Submit three copies of all pertinent manifests to the Owner. Use a single source facility for disposal of all waste of similar type and category.

g. Submittals: Prior to commencement of the work on this project, the Contractor must submit the following to the Owner:

1) Copy of original insurance policy.
2) Copy of Department of Labor notification.
3) Copy of EPA notification.
4) Abatement Plan Layout - Decon, Negative Air Lines, Variances.
5) SUCF Asbestos Removal Fact Sheet.
6) Product Information - Encapsulant, Mask, etc.
7) Material Safety Data Sheets.
8) Asbestos Handling License.
9) Waste Transporter Permits.
10) Dumping Receipt - Waste Manifest.
11) Testing Lab - License, Certification.
12) Employees - Workers Acknowledgement, Certification.
13) Supervisor's Certification

h. Special Requirements

1) The drawings, schedules and specifications indicate the applicable scope of abatement work.

2) The Contractor shall have at least one English-speaking supervisor on the job site at all times while the project is in progress.

3) Prior to the commencement of work involving asbestos demolition, removal, and/or renovation, the Contractor must submit to the Owner the name of its on-site asbestos supervisor responsible for such work and the named supervisor's NYS certification documentation showing completion of an EPA approved training course for asbestos supervisors. The approved supervisor shall maintain such certification during the work and be on site at all times when abatement work is being performed.

4) If a waste shipment record has not been returned to the Owner within 45 days, a report must be filed by the Owner with the EPA describing the steps the Owner has taken to determine the status of the shipment. During the Owner's preparation of the latter report, the Contractor shall give its constant personal attention and assistance in determining the status and disposition of the shipment.

STATE UNIVERSITY CONSTRUCTION FUND
ASBESTOS MATERIAL REMOVAL FACT SHEET

SUCF PROJ NO. _____ PROJECT TITLE _____ DATE _____

SCOPE OF WORK:

_____

_____

ASBESTOS CONTRACTOR:
Name/Address _____
_____
_____
Phone No.: _____

PRIME CONTRACTOR:
(If applicable) _____
_____
_____
Phone No. _____

Contract Award Amount: _____
Contract Completion Date: _____

Asbestos Lic No. _____
Expiration Date: _____

ASBESTOS ABATEMENT PERSONNEL: *(Attach Additional Sheets as Required)*

	Name	Title/Function	Social Security No.	Certificate No.	Expir. Date
1.					
2.					
3.					
4.					
5.					

ASBESTOS ABATEMENT WORK: *(Attach Additional Sheets as Required)*

	Bldg (1) Usage	Removal Location (Bldg/Room)	Mat'l (2) Removed.	Quantity (3)	Methods of Removal
1.					
2.					
3.					
4.					
5.					

Date Removal Begins: _____ Date Removal Ends _____

Asbestos Carrier _____ Disposal Site _____

_____ _____

_____ _____

Phone No. _____ Phone No. _____

Hauler Permit No.(s):

_____

_____

NOTE: In addition to the above information, the contractor shall submit all required documentation as stipulated by the New York State Labor Law Article 30; Part 56, 12NYCRR, which includes a copy of the asbestos contractor license and all asbestos handling certificates, waste transporters permits, disposal receipt acknowledgement, and air test reports (prior, during, and after abatement)

STATE UNIVERSITY CONSTRUCTION FUND
ASBESTOS MATERIAL REMOVAL FACT SHEET

KEY

BUILDING USAGE

A	Administration	F	Dormitory
B	Academic	G	Mechanical Room
C	Library	H	Steam Tunnel
D	Health/Physical Education	I	Other
E	Dining Halls		

MATERIAL REMOVED

Acoustical/Decorative Plasters =	ADP
Fireproofing Materials =	FM
Troweled Wall/Ceiling Plasters =	TCP
Mud Joints/Tees =	MJT
Pipe Covering =	PC (List Pipe Size)
Boiler/Hot Water Tank Insulations =	BHTI
Panels/Ceiling Tiles =	PCT
Transite Panels =	TP
Vent/Drain Pipes =	VDP (List Size)
In-Place Gaskets =	IPG
Vinyl Asbestos Siding =	VAS
Vinyl Asbestos Tile =	VAT
Vinyl Asbestos Roofing =	VAR
Other (Describe) =	0: _____

QUANTITY OF MATERIAL

S.F. = Square Feet i.e. Walls, Ceiling, etc.
L.F. = Linear Feet i.e. Pipe, etc.
WET
DRY
GLOVEBAG
TENT
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RENOVATION SURVEY
FOR
ASBESTOS-CONTAINING MATERIALS, LEAD-BASED PAINT, PCB's & MOLD

PERFORMED AT:

SUNY New Paltz
Peregrine Dining Hall
1 Hawk Drive
New Paltz, New York 12561
Adelaide Project# KSQ:23261.00-IN
SUCF Project# 081056

PREPARED FOR:

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February 5, 2024 Amended

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Version	Date	Prepared by
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2	02/05/24	David Seddon

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1.0 Introduction

1.1 Scope of Work / Project Personnel

Adelaide Environmental Health Associates, Inc. **(Adelaide)** performed an Asbestos, Lead, PCB's and Mold Survey for Building/Structure Demolition, Renovation, Remodeling and/or Repair, in conformance with ALL Federal, State and Local regulations for KSQ Design:

SURVEY LOCATION(S):	SUNY New Paltz Peregrine Dining Hall 1 Hawk Drive New Paltz, New York 12561
SURVEY DATE(S):	November 21, 2023 to November 24, 2023 and December 26, 2023 to December 28, 2023
SCOPE OF WORK:	Gut Renovation Inspection
SCOPE OF WORK BUILDING/ STRUCTURE PLANS UTILIZED:	Prepared by: KSQ Design Dated: December 11, 2023
CERTIFIED ADELAIDE PERSONNEL:	David Seddon (NYS Asbestos Inspector/Cert. #23-6LI1V-SHAB, EPA Lead-based Paint Inspector/Cert. #LBP-I-101120-3 and NYS Mold Assessor/Cert. #MA00172)

Adelaide returned to SUNY New Paltz - Peregrine Dining Hall on February 1st and 2nd, 2024 to conduct wall penetrations for suspect materials.

1.2 Executive Summary

On November 21, 2023, to November 24, 2023 and December 26, 2023 to December 28, 2023, **Adelaide** inspected the exterior and throughout the interior of the first, second and mezzanine floors that will be affected by the proposed scope of work for suspect ACM, LBP, PCBs and Mold.

SUSPECT HAZARDOUS MATERIAL	SAMPLE(S)/LAYER(S)/ READING(S) COLLECTED	SAMPLE(S) / HOMOGENEOUS AREA(S) IDENTIFIED POSITIVE
Asbestos-containing Materials (ACM):	316	16
Lead-based Paint (LBP):	110 (plus calibrations)	13
PolyChlorinated Biphenyls (PCB):	26	11
Indoor Air Quality / Mold:	7	Suspect Mold Growth Observed

As per returning to the site on February 1st and 2nd, 2024, **Adelaide** inspected portions of the exterior, first floor rooms 107, 153, 155, computer room, storage room D, second floor dining room, simple zone room, kitchen storage room, and women's bathroom that will be affected by the proposed scope of work for suspect ACM.

SUSPECT HAZARDOUS MATERIAL	SAMPLE(S) COLLECTED	SAMPLE(S) / HOMOGENEOUS AREA(S) IDENTIFIED POSITIVE
Asbestos-containing Materials (ACM):	0	N/A

NOTE: The bakery area on the first floor was only limited to materials above the ceiling due to scope of work provided by Michael Weatherly – SUNY New Paltz Campus Architect, the bakery area was not going to be impacted by this project.

The following indicates assumed materials due to damaging the UL rating for the fire doors and inaccessibility of the spray-on fireproofing at the time of the inspection.

- PACM – Fire Doors throughout the building
- PACM – Spray-On fireproofing on support beam
- PACM – Furnace Interior Materials

The tape lift sample shows a very heavy growth of Cladosporium and Alternaria on the ceiling tile in the computer room office and a very heavy growth of Cladosporium and heavy growth of Stachybotrys on the ceiling tile in the computer room ceiling. The indoor air samples show a mold spore concentration of mostly Ascospores, Basidiospores consistent with the outdoor ambient air samples, however it did show mold spore concentration of Cladosporium not consistent with the outdoor ambient air sample with a low amount of fibrous particulates.

Site Limitation:

- Internal wall cavities were not assessed.

There are **asbestos materials that will be impacted** by this scope of work as described in section 1.1. These materials are listed in section 2.1.

1.3 Conclusions and Recommendations

The following conclusions and recommendations are prepared by **Adelaide** as per the provided scope of work for Building/Structure Demolition, Renovation, Remodeling and/or Repair. Should the scope of work change, it is recommended that the findings be revisited to determine if additional sampling will be required to satisfy ALL Federal, State and Local regulations.

The materials sampled, as part of this survey, were limited to building materials potential affected by the provided scope of work only. All building materials outside the scope of work that have the potential to be disturbed, impacted, or if the scope of work is to change, are to be presumed asbestos-containing materials (PACM). Identified PACM **must** either be sampled by a licensed NYS Asbestos Inspector and/or abated/removed and disposed of by a licensed NYS Asbestos Abatement Contractor.

1.4 Asbestos-containing Materials (ACM)

- This survey concluded that the materials listed in Section 2.1 either tested and/or are assumed ***positive for asbestos***.

- There are asbestos materials that will be impacted by this scope of work. These materials are listed in section 2.1. Refer to Appendix A for the approximate location of the above materials in the affected scope of work.

- Subpart 56-5(h) of 12 NYCRR Part 56 requires that no demolition, renovation, remodeling, or repair work be commenced by any owner or the owner's agent prior to the completion of asbestos abatement. Asbestos abatement must be performed by an asbestos abatement contractor that maintains a current asbestos handling license and employs NYSDOL/NYCDEP certified asbestos handlers and supervisors. It is recommended that a 12 NYCRR 56 certified Project Monitor oversee abatement activities.

- Subpart 56-5(g) of 12 NYCRR Part 56 specifies requirements for transmittal of asbestos survey information by the owner or owner's agent. (1) One copy of the asbestos survey report shall be sent to the local government entity charged with issuing a permit for such demolition, renovation, remodeling, or repair work under applicable State or local laws. (2) If controlled demolition or pre-demolition activities will be performed, one copy of the asbestos survey report shall be submitted to the appropriate Asbestos Control Bureau district office. (3) One copy of the asbestos survey report must be kept on the construction site throughout the duration of the asbestos project and any associated demolition, renovation, remodeling, or repair project.

1.5 Lead-based Paint (LBP)

- This survey concluded that the readings summarized in Section 2.3 and Appendix E tested ***positive for lead-based paint.***

- These areas must be either abated or Lead safe work practices must be implemented during the demolition, renovation, remodeling, or repair activities if these areas are to be disturbed.

1.6 PolyChlorinated Biphenyls (PCB)

- This survey concluded that the materials listed in Section 2.4 and Appendix G tested ***positive for PCBs.***

- These materials must be removed and disposed of in accordance with ALL Federal, State and Local regulations.

1.7 Indoor Air Quality / Mold

Mold contaminated building materials are present and are recommended for removal/disposal, along with mitigation activities to resolve the cause for the mold. Follow the mold remediation plan in Section 2.5.

2.0 Summary of Hazardous Materials

2.1 Summary of Identified ACM/PACM

KEY: **ACM** = Materials containing greater than 1% of asbestos; **HA** = Homogeneous Area; **LF** = Linear Feet; **SF** = Square Feet; **PACM** = Presumed Asbestos-containing Materials; **Friable** = ACM capable of being released into air, and which can be crumbled, pulverized, powdered, crushed or exposed by hand-pressure; [A] = Material is considered non-friable solely in an intact and undisturbed state, however, may be rendered friable if pulverized or crumbled while in dry state.

Samples collected by **Adelaide** November 21, 2023 to November 24, 2023 and December 26, 2023 to December 28, 2023

HA	Identified ACM	ACM Location(s)	Approx. Qty.	Condition	Friable? (Yes or No)
012	Older Caulk at Louver	Middle Roof	1 Vent 40 LF	Damaged	No
		Lower Roof	4 Vents 30 LF	Damaged	No
		Exterior East Elevation	2 Vents 6 LF	Damaged	No
015	HVAC Duct Insulation	Mezzanine Mechanical Room	600 SF	Good	Yes
018	Vibration Cloth (Canvis Type)		20 SF	Good	No
032	Tar Coated Light Wire (Soffit Can Light Whips)	Exterior North Elevation	5 Can Lights 2 Square Lights 14 LF	Good	No
032	Tar Coated Light Wire (Soffit Can Light Whips)	Exterior South Elevation	5 Can Lights 2 Square Lights 14 LF	Good	No
		Exterior East Elevation	2 Can Lights 4 LF	Good	No
		Exterior West Elevation	8 Can Lights 16 LF	Good	No
033	Old Light Wire (Abandoned)	Above Dining Room Ceiling	300 LF	Good	No
040	Transite Soffit	Exterior North Elevation	960 SF	Good	No
		Exterior South Elevation	960 SF	Good	No
		Exterior East Elevation	200 SF	Good	No
		Exterior West Elevation	1,400 SF	Good	No
066	Window Glazing Sealant	Second Floor – Dining Room	10 Windows 740 LF	Good	No

HA	Identified ACM	ACM Location(s)	Approx. Qty.	Condition	Friable? (Yes or No)
066	Window Glazing Sealant	Second Floor – Office	1 Window 74 LF	Good	No
		Second Floor – Office	1 Window 74 LF	Good	No
		Second Floor – Office	1 Window 74 LF	Good	No
		Second Floor – Office	1 Window 74 LF	Good	No
	Window Glazing Sealant for Door Window Pane	First Floor – Stairwell	1 Window 4 LF	Good	No
082	9x9 Floor Tile	Stairwell Landings	64 SF	Damaged	No
		First Floor – Storage Room D	100 SF	Good	No
		First Floor – Storage Room C	100 SF	Good	No
083	9x9 Floor Tile Mastic	Stairwell Landings	64 SF	Good	No
		First Floor – Storage Room D	100 SF	Good	No
		First Floor – Storage Room C	100 SF	Good	No
102	Floor Tile and Mastic	Second Floor – Office	121 SF	Good	No
119	HVAC Pin Mastic	First Floor – Mechanical Room	75 SF	Good	No
124	Mudded Fittings	First Floor – Mechanical Room	70 Fittings	Good	Yes
		First Floor – Hallway at Radiator	2 Fittings	Good	Yes
		First Floor – Above Hallway Water Fountain	1 Fitting	Good	Yes
	Mudded Fittings Assumed behind Original CMU Walls	First Floor – Men's Bathroom	18-22 Fittings	Unknown	Yes
124	Mudded Fittings Assumed behind Original CMU Walls	First Floor – Women's Bathroom	18-22 Fittings	Unknown	Yes
		First Floor – Janitors Closet	4-6 Fittings	Unknown	Yes
		Second Floor – Kitchen	40-60 Fittings	Unknown	Yes
		Second Floor – Old Dishwashing Area	20-40 Fittings	Unknown	Yes
		Second Floor – All Gender Bathroom	4-6 Fittings	Unknown	Yes
		Second Floor – Janitors Closet	4-6 Fittings	Unknown	Yes

HA	Identified ACM	ACM Location(s)	Approx. Qty.	Condition	Friable? (Yes or No)
124	Mudded Fittings Assumed behind Original CMU Walls	Second Floor – Trash Room	4-6 Fittings	Unknown	Yes
	Mudded Fittings Assumed above Metal Ceiling System	First Floor – Kitchen	60-100 Fittings	Unknown	Yes
126	Water Tank Insulation	First Floor – Mechanical Room	175 SF	Good	Yes
129	Glue Daubs for Ceiling Block Material	First Floor – Mechanical Room	1,440 SF	Good	No
		First Floor – Electrical Room	340 SF	Good	No
138	Caulking – Older Red	First Floor – Exterior Hallway Door	1 Door 17 LF	Good	No
		First Floor – Exterior North Storefront Door	1 Door 40 LF	Good	No
		First Floor – Exterior South Storefront Door	1 Door 40 LF	Good	No
		First Floor – Exterior Electrical Transformer Room Door	1 Door 17 LF	Good	No
		First Floor – Exterior Generator Room Door	1 Door 17 LF	Good	No
		Second Floor – Loading Dock Stairwell Door	1 Door 17 LF	Good	No
	Caulking – Older Red at Window and Door System	Second Floor – East Loading Dock	1 Door and Window System 40 LF	Good	No
	Caulking – Older Red at Windows	Second Floor – East Loading Dock	2 Windows 20 LF	Good	No
142	Waterproofing at Concrete Foundation	First Floor – Newer Furnace Mechanical Room	100 SF	Good	No
PACM	Spray-On Fireproofing	First Floor – Dry Storage Room (107)	75 SF	Good	Yes

HA	Identified ACM	ACM Location(s)	Approx. Qty.	Condition	Friable? (Yes or No)
PACM	Fire Doors	First Floor	26 Single Doors 520 SF 1 Double Doors 40 SF Total 560 SF	Unknown	Unknown
		Second Floor	19 Single Doors 380 SF 5 Double Doors 100 SF Total 480 SF	Unknown	Unknown
PACM	Furnace Materials/Components	First Floor – Newer Furnace Mechanical Room	Unknown	Unknown	Unknown

2.2 Summary of Identified Non-ACM

Samples collected by **Adelaide** November 21, 2023 to November 24, 2023 and December 26, 2023 to December 28, 2023

Identified Non-ACM	Sample Location(s)
Top Layer – Rolled Roofing	Upper, Middle and Lower Roof
2nd and 5th Layers – Dens Meterial Board	
3rd Layer – ISO Paper	
4th Layer – Vapor Barrier Material	
Repair Material	Middle and Lower Roof
Tar on Exhaust Unit	
Tar at Wall on Bricks	
Roof Drain Tar	
Perlite Cant Board	Upper, Middle and Lower Roof
Pitch Pocket Material	Middle and Lower Roof
Newer Caulk for Louvers	
Caulking at Exhaust Pipe	Furnace Room Roof Area
Caulking at Exhaust Unit	
Mudded Fitting for Roof Drain Pipe	First Floor – Mechanical Room, Men's Bathroom Second Floor – All Gender Bathroom, Janitors Closet Mezzanine Floor – Mechanical Space
HVAC Duct Cloth Wrap	Mezzanine Floor – Mechanical Space

Identified Non-ACM	Sample Location(s)
Tar on Concrete Deck and Concrete	Furnace Room Roof Area
Wall Material (Perlite)	Mezzanine Floor – Mechanical Space
Brick Material	First Floor – Exterior Second Floor – Dining Area Interior, Exterior **Mezzanine Floor –** Mechanical Space
CMU and Mortar	**First Floor –** Computer Room (131), Computer Office (132), Computer Storage Room (133), Lounge (101), Vestibule (100), Office (151), Office (152), Conference Room (153), Office (154), Storage (155), Work Area (156), Office (157), Office (158), North Vestibule (104), Storage A (105), Passage (102), South Vestibule, Storage Room B, Storage Room C, Storage Room D, Janitors Closet, Men's Bathroom, Janitors Closet (118), Storage G, Server Closet, Cafeteria Area (103A & B), Passage (123), Women's Bathroom, Hallway, Dry Storage (107), Walk-In Cooler Room (110), Storage E, Electrical Closet (106), Mechanical Equipment Room, Electrical Transformer Room (116), Generator Room, Exterior **Second Floor –** Kitchen Manager Office, Trash Room, Storage Room, Locker Room, Kitchen, New Dishwashing Area, Old Dishwashing Area, Dining Area, Operations Manager Office, Marketing Manager Office, Registered Dietitian Office, Simple Zone Eating Area, All Gender Bathroom, Janitors Closet, Furnace Room, Walk-In Cooler Area, Loading Dock Entry Area, Serving Area, Serving Area **Mezzanine Floor –** Mechanical Space

Identified Non-ACM	Sample Location(s)
Main Branch Circuit Wire – Braided	**First Floor –** Computer Room (131), Computer Office (132), Computer Storage Room (133), Lounge (101), Vestibule (100), Office (151), Office (152), Conference Room (153), Office (154), Storage (155), Work Area (156), Office (157), Office (158), North Vestibule (104), Storage A (105), Passage (102), South Vestibule, Storage Room B, Storage Room C, Storage Room D, Janitors Closet, Men's Bathroom, Janitors Closet (118), Storage G, Server Closet, Cafeteria Area (103A & B), Passage (123), Women's Bathroom, Hallway, Dry Storage (107), Walk-In Cooler Room (110), Storage E, Electrical Closet (106), Mechanical Equipment Room, Electrical Transformer Room (116), Generator Room, Exterior **Second Floor –** Kitchen Manager Office, Trash Room, Storage Room, Locker Room, Kitchen, New Dishwashing Area, Old Dishwashing Area, Dining Area, Operations Manager Office, Marketing Manager Office, Registered Dietitian Office, Simple Zone Eating Area, All Gender Bathroom, Janitors Closet, Furnace Room, Walk-In Cooler Area, Loading Dock Entry Area, Serving Area **Mezzanine Floor –** Mechanical Space
Light Wire – Vinyl	**First Floor –** Computer Room (131), Computer Office (132), Computer Storage Room (133), Lounge (101), Vestibule (100), Office (151), Office (152), Conference Room (153), Office (154), Storage (155), Work Area (156), Office (157), Office (158), North Vestibule (104), Storage A (105), Passage (102), South Vestibule, Storage Room B, Storage Room C, Storage Room D, Janitors Closet, Men's Bathroom, Janitors Closet (118), Storage G, Server Closet, Cafeteria Area (103A & B), Passage (123), Women's Bathroom, Hallway, Dry Storage (107), Walk-In Cooler Room (110), Storage E, Electrical Closet (106), Mechanical Equipment Room, Electrical Transformer Room (116), Generator Room, Exterior

Identified Non-ACM	Sample Location(s)
Light Wire – Vinyl	**Second Floor –** Kitchen Manager Office, Trash Room, Storage Room, Locker Room, Kitchen, New Dishwashing Area, Old Dishwashing Area, Dining Area, Operations Manager Office, Marketing Manager Office, Registered Dietitian Office, Simple Zone Eating Area, All Gender Bathroom, Janitors Closet, Furnace Room, Walk-In Cooler Area, Loading Dock Entry Area, Serving Area **Mezzanine Floor –** Mechanical Space
Main Branch Circuit Wire – Vinyl	**First Floor –** Computer Room (131), Computer Office (132), Computer Storage Room (133), Lounge (101), Vestibule (100), Office (151), Office (152), Conference Room (153), Office (154), Storage (155), Work Area (156), Office (157), Office (158), North Vestibule (104), Storage A (105), Passage (102), South Vestibule, Storage Room B, Storage Room C, Storage Room D, Janitors Closet, Men's Bathroom, Janitors Closet (118), Storage G, Server Closet, Cafeteria Area (103A & B), Passage (123), Women's Bathroom, Hallway, Dry Storage (107), Walk-In Cooler Room (110), Storage E, Electrical Closet (106), Mechanical Equipment Room, Electrical Transformer Room (116), Generator Room, Exterior **Second Floor –** Kitchen Manager Office, Trash Room, Storage Room, Locker Room, Kitchen, New Dishwashing Area, Old Dishwashing Area, Dining Area, Operations Manager Office, Marketing Manager Office, Registered Dietitian Office, Simple Zone Eating Area, All Gender Bathroom, Janitors Closet, Furnace Room, Walk-In Cooler Area, Loading Dock Entry Area, Serving Area **Mezzanine Floor –** Mechanical Space
ARC Board – Red	**First Floor –** All Electrical Panels and Disconnect Panels **Second Floor –** All Electrical Panels and Disconnect Panels **Mezzanine Floor –** All Electrical Panels and Disconnect Panels

Identified Non-ACM	Sample Location(s)
ARC Paper – Gray	**First Floor –** All Electrical Panels and Disconnect Panels **Second Floor –** All Electrical Panels and Disconnect Panels **Mezzanine Floor –** All Electrical Panels and Disconnect Panels
ARC Board – Black	**First Floor –** All Electrical Panels and Disconnect Panels **Second Floor –** All Electrical Panels and Disconnect Panels **Mezzanine Floor –** All Electrical Panels and Disconnect Panels
ARC Board – Brown	**First Floor –** All Electrical Panels and Disconnect Panels **Second Floor –** All Electrical Panels and Disconnect Panels **Mezzanine Floor –** All Electrical Panels and Disconnect Panels
ARC Board – Gray (Type 2)	**First Floor –** Mechanical Room **Second Floor –** Kitchen
Disconnect Panel – Red Board	**First Floor –** All Disconnect Panels **Second Floor –** All Disconnect Panels **Mezzanine Floor –** All Disconnect Panels
Green Carpet Adhesive	**First Floor –** Computer Room (131), Computer Office (132), Computer Storage Room (133), Lounge (101), Vestibule (100), Office (151), Office (152), Conference Room (153), Office (154), Storage (155), Work Area (156), Office (157), Office (158)
4" Covebase Black and Adhesive Newer	**First Floor –** Computer Room (131), Computer Office (132), Computer Storage Room (133), Lounge (101), Vestibule (100), Office (151), Office (152), Conference Room (153), Office (154), Storage (155), Work Area (156), Office (157), Office (158)
Ceiling Tile – Textured Type 1	**First Floor –** Vestibule (100), Office (151), Office (152), Conference Room (153), Office (154), Storage (155), Work Area (156), Office (157), Office (158)
Main Power Cable – Vinyl	**First Floor –** Generator Room
Caulking between Facia Stone	Exterior
Caulking at Window Sill – Gray	Exterior
Caulking at Windows – Red (Soft)	Exterior

Identified Non-ACM	Sample Location(s)
Ceramic Wall Tile – Newer Layer – Grout and Adhesive	**First Floor –** Men's Bathroom, Janitors Closet (118), Women's Bathroom **Second Floor –**All Gender Bathroom
Durarock Board	**First Floor –** Men's Bathroom, Janitors Closet (118), Women's Bathroom **Second Floor –**All Gender Bathroom
Ceramic Wall Tile – Older Layer – Grout and Mudset	**First Floor –** Men's Bathroom, Women's Bathroom, Room 107 **Second Floor –** Trash Room, Locker Room, Kitchen, Old Dishwashing Area, All Gender Bathroom, Janitors Closet, Serving Area
Ceramic Floor Tile Grout and Mudset	**First Floor –**Men's Bathroom, Janitors Closet (118), Women's Bathroom **Second Floor –** Janitors Closet
Caulking at Fixtures	**First Floor –** Men's Bathroom, Janitors Closet (118), Women's Bathroom **Second Floor –**All Gender Bathroom
12x12 Floor Tile – Cream with Black and Brown	**First Floor –** Storage Room A and B
Mastic and Leveler	**First Floor –** Storage Room B
Covebase and Adhesive	**First Floor –** Storage Room B
Sheet Flooring	**First Floor –** Storage Room B
FRP Panel Adhesive	**First Floor –** Storage Room B **Second Floor –** Kitchen, Old Dishwashing Area, Dining Area, Serving Area
Sheetrock and Joint Compound	**First Floor –** Computer Room (131), Computer Office (132), Computer Storage Room (133), Lounge (101), Vestibule (100), Office (151), Office (152), Conference Room (153), Office (154), Storage (155), Work Area (156), Office (157), Office (158), North Vestibule (104), Storage A (105), Passage (102), South Vestibule, Storage Room B, Storage Room C, Storage Room D, Janitors Closet, Men's Bathroom, Janitors Closet (118), Storage G, Server Closet, Cafeteria Area (103A & B), Passage (123), Women's Bathroom, Hallway, Dry Storage (107), Walk-In Cooler Room (110), Storage E, Electrical Closet (106), Mechanical Equipment Room, Electrical Transformer Room (116), Generator Room, Exterior, Bathroom Hallway

Identified Non-ACM	Sample Location(s)
Sheetrock and Joint Compound	**Second Floor –** Office, Trash Room, Storage Room, Locker Room, Kitchen, New Dishwashing Area, Old Dishwashing Area, Dining Area, Operations Manager Office, Marketing Manager Office, Registered Dietitian Office, Simple Zone Eating Area, All Gender Bathroom, Janitors Closet, Furnace Room, Walk-In Cooler Area, Loading Dock Entry Area
Ceiling Tile – Mountains with Holes	**First Floor –**Men's Bathroom, Janitors Closet (118), Women's Bathroom, Bathroom Hallway
Adhesive for Vinyl Flooring	**First Floor –**Bathroom Hallway **Second Floor –**Simple Zone Eating Area
Leveler for Vinyl Flooring	**First Floor –**Bathroom Hallway **Second Floor –**Simple Zone Eating Area
Ceiling Tile – Creators	**First Floor –** Computer Room (131), Computer Office (132), Computer Storage Room (133) **Second Floor –**Simple Zone Eating Area
Carpet Adhesive with Cover	**First Floor –** Computer Room (131), Computer Office (132), Computer Storage Room (133)
Ceiling Tile – Sheetrock Type	**Second Floor –**Serving Area
Fiberglass Pipe Wrap – Cloth Type	**First Floor –** Computer Room (131), Computer Office (132), Computer Storage Room (133), Lounge (101), Vestibule (100), Office (151), Office (152), Conference Room (153), Office (154), Storage (155), Work Area (156), Office (157), Office (158), North Vestibule (104), Storage A (105), Passage (102), South Vestibule, Storage Room B, Storage Room C, Storage Room D, Janitors Closet, Men's Bathroom, Janitors Closet (118), Storage G, Server Closet, Cafeteria Area (103A & B), Passage (123), Women's Bathroom, Hallway, Dry Storage (107), Walk-In Cooler Room (110), Storage E, Electrical Closet (106), Mechanical Equipment Room, Electrical Transformer Room (116), Generator Room, Exterior **Second Floor –** Office, Trash Room, Storage Room, Locker Room, Kitchen, New Dishwashing Area, Old Dishwashing Area, Dining Area, Operations Manager Office, Marketing Manager Office, Registered Dietitian Office, Simple Zone Eating Area, All Gender Bathroom, Janitors Closet, Furnace Room, Walk-In Cooler Area, Loading Dock Entry Area

Identified Non-ACM	Sample Location(s)
Stone Flooring Grout and Mudset/Fill	**First Floor –** Storage Room G, Data Closet, Passage (102) **Second Floor –** Dining Area, Dining Stairwell
Quarry Floor Tile Grout and Mudset	**Second Floor –** Kitchen Manager Office, Trash Room, Storage Room, Locker Room, Kitchen, New Dishwashing Area, Old Dishwashing Area, Janitors Closet, Walk-In Cooler Area, Loading Dock Entry Area, Serving Area
HVAC Duct Sealant – Gray	**First Floor –** Computer Room (131), Computer Office (132), Computer Storage Room (133), Lounge (101), Vestibule (100), Office (151), Office (152), Conference Room (153), Office (154), Storage (155), Work Area (156), Office (157), Office (158), North Vestibule (104), Storage A (105), Passage (102), South Vestibule, Storage Room B, Storage Room C, Storage Room D, Janitors Closet, Men's Bathroom, Janitors Closet (118), Storage G, Server Closet, Cafeteria Area (103A & B), Passage (123), Women's Bathroom, Hallway, Dry Storage (107), Walk-In Cooler Room (110), Storage E, Electrical Closet (106), Mechanical Equipment Room, Electrical Transformer Room (116), Generator Room, Exterior **Second Floor –** Office, Trash Room, Storage Room, Locker Room, Kitchen, New Dishwashing Area, Old Dishwashing Area, Dining Area, Operations Manager Office, Marketing Manager Office, Registered Dietitian Office, Simple Zone Eating Area, All Gender Bathroom, Janitors Closet, Furnace Room, Walk-In Cooler Area, Loading Dock Entry Area
Ceiling Tile – Squiggles with Holes	**Second Floor –** Storage Room, Operations Manager Office, Marketing Manager Office, Registered Dietitian Office
12x12 Floor Tile – Red	Second Floor – Dining Area
12x12 Floor Tile – Yellow	Second Floor – Dining Area
12x12 Floor Tile – Blue	Second Floor – Dining Area
12x12 Floor Tile – Black with White	Second Floor – Dining Area
Floor Tile Mastic	Second Floor – Dining Area
2nd Layer Floor Tile – Beige	Second Floor – Dining Area
2nd Layer Floor Tile – Pink with Beige	Second Floor – Dining Area
Red Concrete Floor Material	Second Floor – Dining Area

Identified Non-ACM	Sample Location(s)
Concrete	**First Floor –** Computer Room (131), Computer Office (132), Computer Storage Room (133), Lounge (101), Vestibule (100), Office (151), Office (152), Conference Room (153), Office (154), Storage (155), Work Area (156), Office (157), Office (158), North Vestibule (104), Storage A (105), Passage (102), South Vestibule, Storage Room B, Storage Room C, Storage Room D, Janitors Closet, Men's Bathroom, Janitors Closet (118), Storage G, Server Closet, Cafeteria Area (103A & B), Passage (123), Women's Bathroom, Hallway, Dry Storage (107), Walk-In Cooler Room (110), Storage E, Electrical Closet (106), Mechanical Equipment Room, Electrical Transformer Room (116), Generator Room, Exterior **Second Floor –** Office, Trash Room, Storage Room, Locker Room, Kitchen, New Dishwashing Area, Old Dishwashing Area, Dining Area, Operations Manager Office, Marketing Manager Office, Registered Dietitian Office, Simple Zone Eating Area, All Gender Bathroom, Janitors Closet, Furnace Room, Walk-In Cooler Area, Loading Dock Entry Area, Server Area
Textured Floor Cover – Dark Gray	**Second Floor –** Locker Room, Kitchen, All Gender Bathroom, Walk-In Cooler Area, Serving Area
Textured Floor Cover – Light Gray	**First Floor –**Hallway, Dry Storage (107), Stairwell Landing **Second Floor –** Storage Room, Walk-In Cooler Area, Loading Dock Entry Area, Serving Area
12x12 Floor Tile – Beige with Beige and Cream Layers	**Second Floor –** Operations Manager Office, Marketing Manager Office, Registered Dietitian Office
Wall Cover Material	**First Floor –** Computer Room (131), Computer Office (132), Computer Storage Room (133) **Second Floor –** Dining Area

Identified Non-ACM	Sample Location(s)
Ceiling Plaster Material – Soft Textured – Top Layer Coat and Base Coat	**First Floor –** Vestibule (100), Office (151), Office (152), Conference Room (153), Office (154), Storage (155), Work Area (156), Office (157), Office (158), Storage Room C, Storage Room D, Janitors Closet, Storage G, Server Closet **Second Floor –** Dining Area, Operations Manager Office, Marketing Manager Office, Registered Dietitian Office, Simple Zone Eating Area
Wall Plaster – Top and Base Coats	**First Floor –** Computer Room (131), Computer Office (132), Computer Storage Room (133), Lounge (101), Vestibule (100), Office (151), Office (152), Conference Room (153), Office (154), Storage (155), Work Area (156), Office (157), Office (158), North Vestibule (104), Storage A (105), Passage (102), South Vestibule, Storage Room B, Storage Room C, Storage Room D, Janitors Closet, Men's Bathroom, Janitors Closet (118), Storage G, Server Closet, Cafeteria Area (103A & B), Passage (123), Women's Bathroom, Hallway, Dry Storage (107), Walk-In Cooler Room (110), Storage E, Electrical Closet (106), Mechanical Equipment Room, Electrical Transformer Room (116), Generator Room, Exterior **Second Floor –** Kitchen Manager Office, Kitchen, New Dishwashing Area, Old Dishwashing Area, Dining Area, Operations Manager Office, Marketing Manager Office, Registered Dietitian Office, Simple Zone Eating Area, All Gender Bathroom, Janitors Closet
Debris on Ceiling Tile	**Second Floor –** Registered Dietitian Office
	First Floor – Lobby
	First Floor – Room 153
	First Floor – Room 157
	First Floor – Men's Bathroom Hallway
Material on Support Beam	**First Floor –** Vestibule (100), Office (151), Office (152), Conference Room (153), Office (154), Storage (155), Work Area (156), Office (157), Office (158), Storage Room C, Storage Room D, Janitors Closet, Storage G, Server Closet **Second Floor –** Dining Area, Operations Manager Office, Marketing Manager Office, Registered Dietitian Office, Simple Zone Eating Area

Identified Non-ACM	Sample Location(s)
Covebase and Adhesive	**First Floor –** Computer Room (131), Computer Office (132), Computer Storage Room (133), Lounge (101)
Wallpaper	**Second Floor –** Kitchen Manager Office, Cooler Entry Area
Wall Panel Adhesive	**Second Floor –** Kitchen Manager Office
Leveling Compound	**Second Floor –** Kitchen Manager Office
Window Glazing Compound – Interior Window	Second Floor – Kitchen Manager Office, Loading Dock Entrance
Terrazzo Floor Basin	Second Floor – Locker Room
Caulking for Terrazzo Floor Basin	Second Floor – Locker Room
Caulking – Interior Door, Wood Trim	**First Floor –** Computer Office (132), Computer Storage Room (133), Lounge (101), Office (151), Office (152), Conference Room (153), Office (154), Storage (155), Work Area (156), Office (157), Office (158), Storage A (105), Storage Room B, Storage Room C, Storage Room D, Janitors Closet, Men's Bathroom, Janitors Closet (118), Storage G, Server Closet, Cafeteria Area (103A & B), Women's Bathroom, Hallway, Dry Storage (107), Storage E, Electrical Closet (106) **Second Floor –** Kitchen Manager Office, Trash Room, Storage Room, Locker Room, Kitchen, Operations Manager Office, Marketing Manager Office, Registered Dietitian Office, Simple Zone Eating Area, All Gender Bathroom, Janitors Closet, Walk-In Cooler Area
Wrap Tape Material for Condenser Pipe	**Second Floor –** Walk-In Cooler Area, Serving Area
Vapor Barrier under Quarry Floor Tile	**Second Floor –** Kitchen Manager Office, Trash Room, Storage Room, Locker Room, Kitchen, New Dishwashing Area, Old Dishwashing Area, Janitors Closet, Walk-In Cooler Area, Loading Dock Entry Area, Serving Area
Brown Stair Tread and Adhesive	**First Floor –** Kitchen Stairwell
Carpet Tile Adhesive	**Second Floor** – Operations Manager Office, Marketing Manager Office,
6" Covebase and Adhesive	**Second Floor –** Operations Manager Office, Marketing Manager Office,
Sink Coating	**Second Floor –** Dining Area
HVAC Duct Sealant – Red	**Second Floor –**All Gender Bathroom, Janitors Closet
HVAC Unit – Top Cover – Cloth	**First Floor –** Mechanical Room **Mezzanine Floor –** Mechanical Spaces
HVAC Unit – Top Cover – Silver	**First Floor –** Mechanical Room

Identified Non-ACM	Sample Location(s)
HVAC Unit – Vinyl Vibration	**First Floor –** All HVAC Ducts **Second Floor –** All HVAC Ducts
Flange / Valve Gasket – Green	**First Floor –** All Flanges and Valves **Second Floor –** All Flanges and Valves **Mezzanine Floor –** All Flanges and Valves
Flange / Valve Gasket – Cream	**First Floor –** All Flanges and Valves **Second Floor –** All Flanges and Valves **Mezzanine Floor –** All Flanges and Valves
Flange / Valve Gasket – Red	**First Floor –** All Flanges and Valves **Second Floor –** All Flanges and Valves **Mezzanine Floor –** All Flanges and Valves
Fiberglass Pipe Wrap with Tar	**First Floor –** Computer Room (131), Computer Office (132), Computer Storage Room (133), Lounge (101), Vestibule (100), Office (151), Office (152), Conference Room (153), Office (154), Storage (155), Work Area (156), Office (157), Office (158), North Vestibule (104), Storage A (105), Passage (102), South Vestibule, Storage Room B, Storage Room C, Storage Room D, Janitors Closet, Men's Bathroom, Janitors Closet (118), Storage G, Server Closet, Cafeteria Area (103A & B), Passage (123), Women's Bathroom, Hallway, Dry Storage (107), Walk-In Cooler Room (110), Storage E, Electrical Closet (106), Mechanical Equipment Room, Electrical Transformer Room (116), Generator Room, Exterior **Second Floor –** Office, Trash Room, Storage Room, Locker Room, Kitchen, New Dishwashing Area, Old Dishwashing Area, Dining Area, Operations Manager Office, Marketing Manager Office, Registered Dietitian Office, Simple Zone Eating Area, All Gender Bathroom, Janitors Closet, Furnace Room, Walk-In Cooler Area, Loading Dock Entry Area
Interior Water Tank Material	**First Floor –** Mechanical Room
Ceiling Block Material	**First Floor –** Mechanical Room and Electrical Room
Red Firestop	**First Floor –** Throughout **Second Floor –** Throughout
Pink Firestop	**First Floor –** Throughout **Second Floor –** Throughout
Ceiling Tile – Textured Type 2	**First Floor –** Hallway, Dry Storage (107), Bakery
Ceiling Tile – Holes	**First Floor –** Bakery
Ceiling Tile – Textured Paper Type	**First Floor –**Dry Storage (107)

Identified Non-ACM	Sample Location(s)
Interior Window Glazing – Gray/Red	**First Floor –** North and South Vestibules
Storefront Caulking – Top Layer – White	**First Floor –** North and South Vestibules
Expansion Joint Caulking	**Exterior**
Asphalt Material	**Exterior**
Material at Metal Ceiling Seam	**Second Floor –** Newer Furnace Mechanical Room
Brown Caulking at Doors	**First Floor –** Vestibule (100)

2.3 Summary of Identified LBP

Based on review of the data generated by the Viken Pb200e X-Ray Fluorescence (XRF) Analyzer(s), the following surfaces tested were identified as lead-based, as defined by HUD/EPA (equal to or in excess of 1.0 milligram per square centimeter):

Readings collected by **Adelaide** November 21, 2023 to November 24, 2023 and December 26, 2023 to December 28, 2023

Location of LBP	LBP Component	Substrate	Color	Condition	Readings (mg/cm2)
Men's Bathroom	Structural Beam	Metal	Red	Poor	4.6
Men's Bathroom	Wall	Ceramic	Cream	Poor	14.9
Storage Room	Door	Metal	Blue	Intact	1.2
Storage Room	Structural Beam	Metal	Off White	Poor	4
Locker Room	Wall Lower	Ceramic	Cream	Fair	13.5
Locker Room	Door	Wood	Blue	Fair	1.2
MER	Structural Beam	Metal	Cream	Fair	4.9
Stairwell	Stair Handrail	Metal	Blue	Fair	1.5
Stairwell	Stair Riser	Metal	Blue	Fair	1.5
Stairwell	Door Case	Metal	Blue	Fair	2.7
Small Storage	Door Case	Metal	Grey	Fair	1.1
Exterior	Door Lintel	Metal	Red	Fair	6.6
Exterior	Window Lintel	Metal	Black	Fair	6

2.4 Summary of Identified PCB-containing Materials

PCB in Caulk Samples collected by **Adelaide** November 21, 2023 to November 24, 2023 and December 26, 2023 to December 28, 2023

Sample #	Location / Description	Material Matrix	Substrate	Approx. Qty.	Analytical Result
PCB-5	Exterior – North Elevation – Stone Façade – Gray	Caulk	Stone/Transite/Metal	354 LF	*41,000*
	Exterior – South Elevation – Stone Façade – Gray		Stone/Transite/Metal	354 LF	
	Exterior – West Elevation – Stone Façade – Gray		Stone/Transite/Metal	594 LF	

Sample #	Location / Description	Material Matrix	Substrate	Approx. Qty.	Analytical Result
PCB-6	Exterior – North Elevation – Windowsill – Gray	Caulk	Metal	7 Windows 35 LF	*99,000*
	Exterior – South Elevation – Windowsill – Gray		Metal	7 Windows 35 LF	
	Exterior – West Elevation – Windowsill – Gray		Metal	10 Windows 50 LF	
PCB-7	Exterior – North Elevation – Window Frame – Red	Caulk	Glass/Metal/Stone	7 Windows 266 LF	*37,000*
	Exterior – South Elevation – Window Frame – Red		Glass/Metal/Stone	7 Windows 266 LF	
	Exterior – East Elevation – Window Frame – Red		Glass/Metal/Stone	2 Windows 30 LF	
	Exterior – West Elevation – Window Frame – Red		Glass/Metal/Stone	10 Windows 266 LF	
PCB-9	Second Floor – Dining Room – Interior Window – Black	Caulk	Glass/Metal	10 Windows 740 LF	*16,000*
	Second Floor – Dining Room – Interior Window – Black		Glass/Metal	1 Window 74 LF	
	Second Floor – Operations Manager Office – Interior Window – Black		Glass/Metal	1 Window 74 LF	
	Second Floor – Marketing Manager Office – Interior Window – Black		Glass/Metal	1 Window 74 LF	
	Second Floor – Registered Dietitian Office – Interior Window – Black		Glass/Metal	1 Window 74 LF	
	Second Floor – Simple Zone Eating Area – Interior Window – Black		Glass/Metal	10 Windows 740 LF	
PCB-10	First Floor – Stairwell – Original Door Frame – Cream	Caulk	Metal/CMU	1 Door 32 LF	*46,000*
	First Floor – Storage Room F – Original Door Frame – Cream		Metal/CMU	1 Door 32 LF	

Sample #	Location / Description	Material Matrix	Substrate	Approx. Qty.	Analytical Result
PCB-10	First Floor – Storage Room E – Original Door Frame – Cream	Caulk	Metal/CMU	1 Door 32 LF	*46,000*
	First Floor – Mechanical Room – Original Door Frame – Cream		Metal/CMU	2 Doors 64 LF	
	First Floor – Walk-In Cooler (110) – Original Door Frame – Cream		Metal/CMU	1 Door 32 LF	
	First Floor – Dry Storage (107) – Original Door Frame – Cream		Metal/CMU	1 Door 32 LF	
	Kitchen Office Manager Office – Original Door Frame – Cream		Metal/Ceramic	1 Door 32 LF	
	Trash Room – Original Door Frame – Cream		Metal/CMU/Ceramic	2 Doors LF	
	Storage Room – Original Door Frame – Cream		Metal/CMU/Ceramic	1 Door 32 LF	
	Locker Room – Original Door Frame – Cream		Metal/CMU/Ceramic	1 Door 32 LF	
	Kitchen – Original Door Frame – Cream		Metal/Ceramic/Plaster	4 Doors 192 LF 1 Doorway 32 FL	
	New Dishwashing Room – Original Door Frame – Cream		Metal/Ceramic/FRP	1 Door 32 LF	
	Walkin Cooler Area – Original Door Frame – Cream		Metal/CMU/Ceramic	1 Door 32 LF	
	Loading Dock Entrance – Original Door Frame – Cream		Metal/CMU/Ceramic	1 Door 16 LF	
	Loading Dock Stairwell – Original Door Frame – Cream		Metal/CMU/Ceramic	2 Doors 64 LF	
PCB-12	Locker Room – Sink Basin – Dark Gray	Caulk	Clay/Terrazzo/Concrete	6 LF	*15,000*
PCB-13	North Vestibule – Window Glazing – Gray	Caulk	Glass/Metal	40 LF	*78,000*
	South Vestibule – Window Glazing – Gray			40 LF	

PCB in Soil Samples collected by **Adelaide** December 26, 2023

Sample #	Location / Description	Material Matrix	Substrate	Approx. Qty.	Analytical Result
PCB – S – 4	Exterior – North West – under Louver – 2" Depth	Soil	Soil/Rock	400 SF 178 CY	*3.2*
PCB – S – 5	Exterior – North West – under Louver – 2" to 6" Depth		Soil/Rock		*1.4*
PCB – S – 6	Exterior – North West – under Louver – 6" to 12" Depth		Soil/Rock		*1.8*
PCB – S – 7	Exterior – North East – Plant Bed under Drip Line – 2" Depth		Soil	240 SF 20 CY	*1.3*

2.5 Summary of Observed/Suspect Mold Growth

Samples collected/Observations made by **Adelaide** November 21, 2023 to November 24, 2023 and December 26, 2023 to December 28, 2023

Location / Description	Substrate	Approx. Qty.
First Floor – Computer Room (131)	Ceiling Tile	*60 SF*
First Floor – Computer Office (132)	Ceiling Tile	*112 SF*
First Floor – Computer Storage (133)	Ceiling Tile	*36 SF*
First Floor – North Vestibule and Portion of Passageway	Sheetrock Ceiling	*196 SF*
First Floor – South Vestibule	Sheetrock Ceiling	*84 SF*
First Floor – Janitors Closet (118)	Ceiling Tile	*36 SF*
First Floor – Dry Storage (107)	Ceiling Tile	*255 SF*
	Wallpaper	*512 SF*
	Sheetrock/Plaster	*512 SF*
First Floor – Bakery Area	Ceiling Tile	*100 SF*
	Sheetrock	*14 SF*
First Floor – Bakery Ware Washing Area	Ceiling Tile	*20 SF*
Second Floor – Kitchen Managers Office	Wall - Wallpaper/Plaster	*500 SF*

2.6 Mold Remediation Plan

The following mold remediation plan should be implemented:

1) **Area(s) to be Remediated**
   - First Floor – Computer Room (131), Computer Office (132), Computer Storage (133), North Vestibule, South Vestibule, Janitors Closet (118), Dry Storage (107), Bakery Area, Bakery Ware Washing Area
   - Second Floor – Kitchen Managers Office

2) Quantities to be Remediated

- First Floor – Computer Room (131) Approx. 60 sf of ceiling tiles
- First Floor – Computer Office (132) Approx. 112 sf of ceiling tiles
- First Floor – Computer Storage (133) Approx. 36 sf of ceiling tiles
- First Floor – North Vestibule and Portion of Passageway Approx. 196 sf of sheetrock ceiling
- First Floor – South Vestibule Approx. 84 sf of sheetrock ceiling
- First Floor – Janitors Closet (118) Approx. 36 sf of ceiling tiles
- First Floor – Dry Storage (107) Approx. 255 sf of ceiling tiles
- First Floor – Dry Storage (107) Approx. 512 sf of wallpaper
- First Floor – Dry Storage (107) Approx. 512 sf of sheetrock/plaster wall
- First Floor – Bakery Area Approx. 100 sf of ceiling tiles
- First Floor – Bakery Area Approx. 14 sf of sheetrock wall
    - Tent 1 – Approx. 60 sf of ceiling tiles
    - Tent 1 – Approx. 8 sf of sheetrock wall
    - Tent 2 – Approx. 16 sf of ceiling tiles
    - Tent 3 – Approx. 8 sf of ceiling tiles
    - Tent 3 – Approx. 6 sf of sheetrock wall
    - Tent 4 – Approx. 16 sf of ceiling tiles
- First Floor – Bakeware Washing Area Approx. 20 sf of Ceiling Tiles
- Second Floor – Kitchen Managers Office Approx. 500 sf of wall plaster and wallpaper

3) Methods for Remediation

- Signage and Caution tape should be utilized to restrict access to remediation work area(s).
- A personal/waste decontamination system enclosure be constructed.
- A containment of the remediation area be established with an air exchange unit (negative pressure) being utilized inside the remediation area(s).
- Removal and bagging of mold contaminated materials to be disposed of properly.
- Cleaning of the remediation area with an EPA approved anti-microbial disinfectant.
- Use of **Clear** Fiberlock Aftershock (a fungicidal coating).

4) Personal Protective Equipment

- Personal protective equipment should be used both during the containment construction as well as during the remediation phase of the project and at a minimum should consist of the following:

    - Respirator
    - Eye protection
    - Gloves
    - Disposable Tyvek suit

5) First Floor Remediation (approx. 29-47 days)

- **North Vestibule and Portion of Passageway (102) (approx. 5 days)**
- Mold contractor to construct a tent structure to encompass the portion of passageway (102) affected ceiling and north vestibule as one work area, (see appendix H for work location).

- Install critical barriers with poly over all doors, windows and all penetrations within the tent structure and north vestibule.
- Utilize an air exchange unit (negative pressure), exhausting to the exterior of the building.
- Removal of all sheetrock ceiling materials within this area to be conducted and disposed of as mold contaminated material.
- Removal of all fiberglass pipe insulation within the work area to be disposed of as mold containing material.
- Non-porous contents, such as but not limited to: metals, glass, plastics, treated woods, etc., can be cleaned with an EPA approved anti-microbial disinfectant and removed from the remediation area after a visual inspection by the mold assessor.
- Once mold contaminated materials and contents have been removed and disposed of; and non-porous contents cleaned and removed; a thorough cleaning with an EPA approved anti-microbial disinfectant of the entire work area needs to be performed of the following items but no limited to: walls and floors (stone floorwork), ceiling components (support beams, ceiling grid, any and all other metal materials).
- A final visual clearance inspection to be completed by a mold assessor for the completeness of the removal and cleaning within the mold abatement work area.

➢ **<u>South Vestibule (approx. 2-3 days)</u>**

- Attach a zippered airlock to the door of the south vestibule, prior to entering.
- Install critical barriers with poly over all doors, windows, and all penetrations within the south vestibule.
- Utilize an air exchange unit (negative pressure), exhausting to the exterior of the building.
- Removal of all sheetrock ceiling materials within this area to be conducted and disposed of as mold contaminated material.
- Removal of all fiberglass pipe insulation within the work area to be disposed of as mold containing material.
- Non-porous contents, such as but not limited to: metals, glass, plastics, treated woods, etc., can be cleaned with an EPA approved anti-microbial disinfectant and removed from the remediation area after a visual inspection by the mold assessor.
- Once mold contaminated materials and contents have been removed and disposed of; and non-porous contents cleaned and removed; a thorough cleaning with an EPA approved anti-microbial disinfectant of the entire work area needs to be performed of the following items but no limited to: walls and floors (stone floorwork), ceiling components (support beams, ceiling grid, any and all other metal materials).
- A final visual clearance inspection to be completed by a mold assessor for the completeness of the removal and cleaning within the mold abatement work area.

➢ **<u>Computer Lab (131), Computer Office (132) and Storage (133) (approx. 7-14 days)</u>**

- Mold contractor to construct a tent structure to encompass the affected portion of the computer room (one ceiling tile grid from the last visible sign of mold) and the entire computer office and storage room as one work area. (see appendix H for work location).
- Install critical barriers with poly over all doors, windows and all penetrations within the tent structure, office, and storage room.
- Utilize an air exchange unit (negative pressure), exhausting to the exterior of the building.

- Removal of all office furniture and contents to be sent out after a general cleaning by mold abatement contractor.
- Removal of all ceiling tiles within the work area to be disposed of as mold contaminated materials.
- Removal of all porous contents, such as but not limited to: fiberglass pipe insulation, fiberglass HVAC duct insulation, etc., to be disposed of as mold contaminated materials.
- Non-porous contents, such as but not limited to: metals, glass, plastics, treated woods, etc., can be cleaned with an EPA approved anti-microbial disinfectant and removed from the remediation area after a visual inspection by the mold assessor.
- Once mold contaminated materials and contents have been removed and disposed of; and non-porous contents cleaned and removed; a thorough cleaning with an EPA approved anti-microbial disinfectant of the entire work area needs to be performed of the following items but no limited to: walls and floors (carpet), ceiling components (support beams, ceiling grid, any and all other metal materials).
- A final visual clearance inspection to be completed by a mold assessor for the completeness of the removal and cleaning within the mold abatement work area.

➢ **Dry Storage (107) (approx. 7-14 days)**

- Attach a zippered airlock to the door of room 107, prior to entering.
- Install critical barriers with poly over windows and all penetrations in the room.
- Utilize an air exchange unit (negative pressure), exhausting to the exterior of the building.
- Removal of all ceiling tiles and sheetrock walls within the work area to be disposed of as mold contaminated materials.
- Removal of all porous contents, such as but not limited to: fiberglass pipe insulation, fiberglass HVAC duct insulation, etc., to be disposed of as mold contaminated materials.
- Removal of all loose floor material (epoxy).
- Non-porous contents, such as but not limited to: metals, glass, plastics, treated woods, etc., can be cleaned with an EPA approved anti-microbial disinfectant and removed from the remediation area after a visual inspection by the mold assessor.
- Once mold contaminated materials and contents have been removed and disposed of; and non-porous contents cleaned and removed; a thorough cleaning with an EPA approved anti-microbial disinfectant of the entire work area needs to be performed of the following items but no limited to: walls, floors, ceiling components (support beams, ceiling grid, any and all other metal materials).
- A final visual clearance inspection to be completed by a mold assessor for the completeness of the removal and cleaning within the mold abatement work area.

➢ **Janitors Closet (118) (approx. 2-4 days)**

- Attach a zippered airlock to the door of the janitor's closet, prior to entering.
- Install critical barriers with poly over windows and all penetrations in the room.
- Utilize an air exchange unit (negative pressure), exhausting to the exterior of the building.
- Removal of all ceiling tiles within the work area to be disposed of as mold contaminated materials.
- Removal of all porous contents, such as but not limited to: fiberglass pipe insulation, fiberglass HVAC duct insulation, etc., to be disposed of as mold contaminated materials.

- Non-porous contents, such as but not limited to: metals, glass, plastics, treated woods, etc., can be cleaned with an EPA approved anti-microbial disinfectant and removed from the remediation area after a visual inspection by the mold assessor.
- Once mold contaminated materials and contents have been removed and disposed of; and non-porous contents cleaned and removed; a thorough cleaning with an EPA approved anti-microbial disinfectant of the entire work area needs to be performed of the following items but no limited to: walls, floors, ceiling components (support beams, ceiling grid, any and all other metal materials).
- A final visual clearance inspection to be completed by a mold assessor for the completeness of the removal and cleaning within the mold abatement work area.

➢ **<u>Bakery Area (approx. 4-8 days)</u>**

- Work areas will consist of multiple tents (total of four work areas).
- Construction of tents within the bakery area will extend one ceiling tile past the visible mold in either direction. (see appendix H for work location).
- Install critical barriers with poly over all penetrations in the containment tent.
- Utilize an air exchange unit (negative pressure), exhausting to the exterior of the building.
- Removal of affected ceiling tiles to disposed of as mold contaminated materials.
- Removal of all porous contents, such as but not limited to: fiberglass pipe insulation, fiberglass HVAC duct insulation, etc., to be disposed of as mold contaminated materials.
- Non-porous contents, such as but not limited to: metals, glass, plastics, treated woods, etc., can be cleaned with an EPA approved anti-microbial disinfectant and removed from the remediation area after a visual inspection by the mold assessor.
- Once mold contaminated materials and contents have been removed and disposed of; and non-porous contents cleaned and removed; a thorough cleaning with an EPA approved anti-microbial disinfectant of the entire work area needs to be performed of the following items but no limited to: walls, floors, ceiling components (support beams, ceiling grid, any and all other metal materials).
- A final visual clearance inspection to be completed by a mold assessor for the completeness of the removal and cleaning within the mold abatement work area.

➢ **<u>Bakeware Washing Area (approx. 2-4 days)</u>**

- The work area will consist of one tent containment.
- Construction of tent within the bakeware washing area, the tent will extend one ceiling tile past the visible mold in either direction. (see appendix H for work location).
- Install critical barriers with poly over all penetrations in the containment tent.
- Utilize an air exchange unit (negative pressure), exhausting to the exterior of the building.
- Removal of affected ceiling tiles to disposed of as mold contaminated materials.
- Removal of all porous contents, such as but not limited to: fiberglass pipe insulation, fiberglass HVAC duct insulation, etc., to be disposed of as mold contaminated materials.
- Non-porous contents, such as but not limited to: metals, glass, plastics, treated woods, etc., can be cleaned with an EPA approved anti-microbial disinfectant and removed from the remediation area after a visual inspection by the mold assessor.

- Once mold contaminated materials and contents have been removed and disposed of; and non-porous contents cleaned and removed; a thorough cleaning with an EPA approved anti-microbial disinfectant of the entire work area needs to be performed of the following items but no limited to: walls, floors, ceiling components (support beams, ceiling grid, any and all other metal materials).
- A final visual clearance inspection to be completed by a mold assessor for the completeness of the removal and cleaning within the mold abatement work area.

6) Second Floor Remediation (approx. 5-7 days)

➢ **<u>Kitchen Managers Office</u>**

- Attach a zippered airlock to the basement door, prior to entering.
- Install critical barriers with poly over windows and all penetrations in the office.
- Utilize an air exchange unit (negative pressure), exhausting to the exterior of the building.
- Removal of all office furniture and contents to be sent out after a general cleaning by mold abatement contractor.
- Removal of all wood wall sheathing to be disposed of as mold contaminated material.
- Removal of all porous contents, such as but not limited to: wallpaper and plaster to be disposed of as mold contaminated material.
- Removal of all non-load bearing wood studs/plates that are rotting or contaminated with mold to be disposed of as mold contaminated.
- Non-porous contents, such as but not limited to: metals, glass, plastics, treated woods, etc., can be cleaned with an EPA approved anti-microbial disinfectant and removed from the remediation area after a visual inspection by the mold assessor.
- Once mold contaminated materials and contents have been removed and disposed of; and non-porous contents cleaned and removed; a thorough cleaning with an EPA approved anti-microbial disinfectant of the entire office needs to be performed of the following items but no limited to: walls and floors (quarry tile, floor tile and concrete floors and remaining clean wood/metal studs and CMU walls).
- A final visual clearance inspection to be completed by a mold assessor for the completeness of the removal and cleaning within the mold abatement work area.

7) Clearance Criteria

- Visual inspection by mold assessor.
- Air sampling and tape samples will be used at the discretion of the mold assessor after the visual inspection is complete.

8) Remediation Cost Estimate & Duration

- Based on the assessment and remediation plan provided, the projected cost of remediation would likely be in the range of $170,000 and $285,000. **Adelaide** provides this cost estimate for budgeting purposes only, and recommends getting a more accurate cost estimate from a NYS licensed Mold Contractor. The duration of remediation activities will take approximately 34 to 54 days.

9) Post-remediation Recommendations

- Based on the ambient air results, tape lift samples and visual assessment the following are recommendations for corrective actions.
- First Floor – Computer Room (131) – Correction of condensation of HVAC duct.
- First Floor – Computer Office (132) – Correction of condensation of HVAC duct.
- First Floor – Computer Storage (133) – Correction of condensation of HVAC duct.
- First Floor – North Vestibule and Portion of Passageway – Correction of condensation of HVAC duct and leaking pipes.
- First Floor – South Vestibule – Correction of condensation of HVAC duct and leaking pipes.
- First Floor – Janitors Closet (118) – Correction of leaking pipes.
- First Floor – Dry Storage (107) – Correction of condensation of HVAC duct and leaking pipes.
- First Floor – Bakery Area – Correction of condensation of HVAC duct and leaking pipes.
- First Floor – Bakery Ware Washing Area – Correction of condensation of HVAC duct and leaking pipes.
- Second Floor – Kitchen Managers Office – Correction of possible water filtration form exterior brickwork.

It will be at the discretion of the mold assessor, during remediation activities, to change and/or alter the above mold remediation plan.

2.7 Observations

ASBESTOS-CONTAINING MATERIALS (ACM)

A visual inspection was performed, and homogeneous material types were established based on appearance, color and texture. The findings presented in this report are based upon reasonably available information and observed site conditions at the time the assessment was performed. The findings and conclusions of this report are not meant to be indicative of future conditions at the site and does not warrant against conditions that were not evident from visual observations or historical information obtained from others.

On November 21, 2023 to November 24, 2023 and December 26, 2023 to December 28, 2023, representative bulk sampling was performed on suspect building materials for laboratory analysis and the following is a summary of installed building materials sampled as per the scope of work provided:

- Ceiling Materials – Plaster, Sheetrock, Joint Compound, Ceiling Tiles (multiple types), Transite, Concrete, Block Material and Glue Daubs.

- Wall Materials – Perlite Material, Brick Mortar, CMU and Mortar, Plaster, Sheetrock, Joint Compound, Ceramic Tile System (ie. grout, adhesive, mortar, etc.) (multiple types), Paneling Adhesive (multiple types), Cove Base Molding & Adhesive (multiple types), Stone (grout, mortar, fill, etc.), Durarock Wall Board, Leveler, Vinyl Floor Adhesive, Concrete, Wallpaper/Wall Cover Material, Waterproofing.

- Flooring Materials – Carpet Adhesive (multiple types), Floor Tile and Mastic (multiple types), Sheet Flooring, Ceramic Tile Systems (ie. grouts, mudsets, etc.), Vapor Barrier, Stone (grout, mortar, fill, etc.), Quarry Tile (grout, mortar, fill, etc.), Concrete, Epoxy (multiple types), Tread and Adhesive.

- Roofing Materials – Rolled Roofing, Vapor Barrier/Tar (multiple types), Den's Board, Perlite Board, ISO, Repair Material, Pitch Pocket Material.

- Thermal System Insulation – Pipe Insulation Wrap (multiple types), Mudded Fittings, Roof Drain Fittings, HVAC Duct Wrap (multiple types) and Insulation, Water Tank Insulation.

- Miscellaneous Materials – Window Glazing (multiple types), Caulking (multiple types), Vibration Cloth, Electrical Wire (braided and vinyl), Light Wire (tar and vinyl), ARC Board (multiple types), Sealants (multiple types), Terrazzo Basin, Wrap Tape Material, Sink Coating, Pin Mastic, Flange Gaskets (multiple types), Water Tank Interior Material, Firestop (multiple types), Asphalt.

- Non-suspect Materials (not sampled) – Fiberglass Insulation, Silicone, Wood, Glass, Metal.

The following observations were made during the mold assessment:
- The ventilation system appeared to be operational.
- No windows were open.

Suspect and/or identified hazardous materials are present and WILL NOT be impacted by remediation activities.

3.0 Asbestos-containing Materials (ACM)

3.1 Field Procedures and Analysis Methodology

Guidelines used for the inspection were established by the U.S. Environmental Protection Agency (EPA) in the Guidance for Controlling Asbestos Containing Materials in Buildings, Office of Pesticides and Toxic Substances, DOC# 560/5-85-024 and 40 CFR Part 763, Asbestos Hazard Emergency Response Act (AHERA) and Title 12 NYCRR Part 56-5.1. Field information was organized as per the AHERA concept of a homogeneous area (HA); that is, suspect Asbestos-containing Materials (ACM) with similar age, appearance, and texture were grouped together, sampled and assessed for condition.

For the purposes of this inspection, suspect ACM has been placed in three material categories: thermal, surfacing, and miscellaneous. 1) Surfacing materials are those that are sprayed on, troweled on or otherwise applied to surfaces for fireproofing, acoustical, or decorative purposes (e.g., wall and ceiling plaster). 2) Thermal materials are those applied to heat pipes or other structural components to prevent heat loss or gain or prevent water condensation (e.g., pipe and fitting insulation, duct insulation, boiler flue). 3) Miscellaneous materials are interior building materials on structural components, structural members or fixtures, such as floor and ceiling tiles, etc. and do not include surfacing material or thermal system insulation.

SURFACING MATERIALS

Surfacing materials were grouped into homogeneous sampling areas. A homogeneous area contains material that is uniform in color and texture and appears identical in every other respect. Materials installed at different times belong to different sampling areas. Homogeneous areas were determined on per floor basis.

The following protocol was used for determining the number of samples to be collected:

- At least three bulk samples were collected from each homogeneous area that is 1,000 square feet or less.
- At least five bulk samples were collected from each homogeneous area that is greater than 1,000 square feet but less than or equal to 5,000 square feet.
- At least seven bulk samples were collected from each homogeneous area that is greater than 5,000 square feet.

THERMAL SYSTEM INSULATION (TSI)

The concept of homogeneous sampling areas applies equally well to thermal insulation as to surfacing material. A "typical" building may contain multiple insulated pipe runs from any combination of the following categories:

- Hot water supply and/or return
- Cold water supply
- Chilled water supply
- Steam supply and/or return
- Roof or system drain

The following protocol was used for determining the number of samples to be collected.

- Collect at least three bulk samples from each homogeneous area of thermal system insulation.
- Collect at least one bulk sample from each homogeneous area of patched thermal system insulation if the patched section is less than 6 linear or square feet.
- In a manner sufficient to determine whether the material is ACM or not ACM, collect a minimum of three bulk samples from each homogeneous insulated mechanical system tee, elbow, and valve.

Bulk samples are not collected from any homogeneous area where the certified inspector has determined that the thermal system insulation is fiberglass, foam glass, or rubber.

MISCELLANEOUS MATERIALS

Miscellaneous materials are grouped into different homogeneous areas and at least two bulk samples are collected from each homogeneous area as per the clarification letter from the EPA and the Professional Abatement Contractors of New York, Inc in November of 2007.

Samples collected were analyzed by a laboratory approved under the New York State Department of Health Environmental Laboratory Approval Program (NYSDOH ELAP). Samples were analyzed in the laboratory by Polarized Light Microscopy (PLM), Polarized Light Microscopy-NOB (PLM-NOB) and/or Quantitative Transmission Electron Microscopy (QTEM), as required. Sample collection and laboratory analysis were conducted in compliance with the requirements of Title 12 NYCRR Part 56-5.1, 29 CFR 1926.1101 and standard EPA & OSHA accepted methods. Samples consisting of multiple layers were separated and analyzed independently in the laboratory.

3.2 Regulatory Guidelines and Requirements for ACM

FEDERAL

In accordance with the Clean Air Act (CAA), the U.S. Environmental Protection Agency (EPA) established National Emission Standards for hazardous Air Pollutants (NESHAP) to protect the public from exposure to airborne pollutants. Asbestos was one of the air pollutants, which was addressed under the NESHAP 40 CFR Part 61. The purpose of asbestos NESHAP regulations is to protect the public health by minimizing the release of asbestos when facilities, which contain ACM, are being renovated or demolished. EPA is responsible for enforcing regulations related to asbestos during renovations and demolition, however, the CAA allows the EPA to delegate this authority to State and Local Agencies. Even after EPA delegate's responsibility to a state or Local agency, EPA retains the authority to oversee agency performance and to enforce NESHAP regulations as appropriate.

NEW YORK STATE

Asbestos in New York State is regulated under the Labor Law Section 906, Part 56 of Title 12 of the Official Compilation of Codes, Rules, and Regulations. Within the department and for the purpose of the Department of Labor, this part (rule) is known as Industrial Code Rule No. 56 (ICR 56) relating to hazards to the public safety and health, during the removal, encapsulation, or disturbance of friable asbestos, or any handling of ACM that may result in the release of asbestos fiber.

As specified in Title 12 NYCRR Part 56-5.1 (h) and (i), "If the building/structure asbestos survey finds that the portion of the building/structure to be demolished, renovated, remodeled, or have repair work contains ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material, which is impacted by the work, the owner or the owner's agent shall conduct, or cause to have conducted, asbestos removal performed by a licensed asbestos abatement contractor in conformance with all standards set forth in this Part. All ACM, PACM, suspect miscellaneous ACM assumed to be ACM, or asbestos material impacted by the demolition, renovation, remodeling or repair project shall be removed as per this Part, prior to access or disturbance by other uncertified trades or personnel. No demolition, renovation, remodeling or repair work shall be commenced by any owner or the owner's agent prior to the completion of the asbestos abatement in accordance with the notification requirements of this Part…All building/structure owners and asbestos abatement contractors on a demolition, renovation, remodeling, or repair project, which includes work covered by this part, shall inform all trades on the work site about PACM, ACM, asbestos material and suspect miscellaneous ACM…Bids may be advertised and contracts awarded for demolition, remodeling, renovation, or repair work, but no work on the current intermediate portion of the project shall commence on the demolition, renovation, remodeling or repair work by any owner or agent prior to completion of all necessary asbestos abatement work for the current intermediate portion of the entire project, in conformance with all standards set forth in this Part." All work conducted should be in accordance with all legal requirements, including but not limited to U.S. Environmental Protection Agency (EPA) National Emissions Standards for Hazardous Air Pollutants (NESHAP) [40 CFR Part 61], New York State Industrial Code Rule 56 Asbestos Regulations (ICR 56) and Chapter 1 of Title 15 of the Rules of the City of New York Regulations, as applicable. Advance notification of the asbestos project to the USEPA, NYSDOL, and NYCDEP may be required.

CONCEALED ACM

In addition to the ACMs identified at the site, there is a possibility that concealed suspect ACM may exist at the building/structure. As such, if any concealed suspect ACM is encountered during future construction related activities, the work should immediately stop. Prior to resuming the work, the suspect ACM should

either be 1) Sampled by an appropriately-certified asbestos professional and submitted to an Approved NYSDOH ELAP laboratory for asbestos analysis or 2) Presumed to be ACM (PACM) and removed by a licensed asbestos abatement contractor for disposal in accordance with all applicable regulations.

4.0 Lead-based Paint (LBP)

4.1 Applicable Standards/Guidelines for LBP

The U.S Department of Housing and Urban Development (HUD) defines the action level for lead-based paint as a lead content equal to or greater than 1.0 milligrams of lead per square centimeter of painted surface (≥1.0 mg Pb/cm^2) when measured with an XRF analyzer or 0.5 percent by weight when chemically tested. This definition is described in the HUD "Lead-Based Paint: Interim Guidelines for Hazard Identification and Abatement in Public and Indian Housing, September 1990". The state of New York's definition of the action level for lead-based paint is consistent with the level established by HUD.

Please note that although the HUD defines lead-based paint as paint having lead concentrations equal or greater than 1.0 mg/cm2, the Occupational Safety and Health Administration (OSHA) considers any concentration of lead in paint to be lead-containing paint. Regardless of the lead concentrations in paint, the contractor shall comply with 29 CFR 1926.62, OSHA regulations, and take precautionary measures for dust control and limit employee exposure to lead dust during the renovations.

Painted surfaces that would be impacted by planned activities such as drilling, cutting, scrapping, etc. and create dust should be properly addressed by following safe work practices, good housekeeping procedures and/or following proper abatement procedures. Grinding and sanding of paint without HEPA filter exhaust, open flame gas fired torch, unconfined abrasive blasting, and chemical strippers containing methylene chloride or other human carcinogenic chemicals are not recommended.

The Federal Resource Conservation and Recovery Act (RCRA) regulation governs the handling, transportation, and disposal of hazardous materials. Every demolition/renovation debris generator has the responsibility to determine whether the debris exhibits one or more of the characteristic wastes listed in subpart C of 40 CFR Part 261. In the case of demolition debris, lead in LBP is a characteristic waste, and therefore, it is the responsibility of the renovation/demolition debris generator to characterize the waste prior to its disposal and, if found to be hazardous waste as defined by Federal Statutes, to be properly handled and disposed.

Metal objects painted with LBP are exempt from disposal regulations applicable to lead, provided they are properly recycled. All metal objects that are painted with LBP should be sent to a certified recycling facility.

This report is not Lead-based Paint abatement specification and should not be used for specifying removal methods or techniques.

4.2 XRF Information

Viken Pb200e X-Ray Fluorescence (XRF) Analyzer(s) were used to survey the building/structure or portion thereof identified to be demolished, renovated, remodeled or repaired for the presence of LBP. The Viken Pb200e XRF Analyzer(s) are using a sealed source of Co-57 with 6mCi sources, meeting HUD requirements for the analysis of paint films. During the analysis, the intensity of the x-rays is converted by the

instrument's internal software into an estimate of the concentration of lead in the substance being analyzed. The results are interpreted as concentrations of lead in milligrams per square centimeter. This device is a field-screening tool, used to collect multiple readings in a short period of time. The method of measurement is based on spectrometric analysis of lead x-ray fluorescence within a controlled depth of interrogation. The reading is an estimate of lead content in all layers of paint. The results are displayed in milligrams per square centimeter (mg/cm2). The device(s) used for this inspection were the Viken Pb200e X-Ray Fluorescence (XRF) Analyzer(s) Serial Number 2104, Source date 4/1/23, Serial number 2231, Source date 5/15/22, Serial number 2595, Source date 2/15/23 and/or Serial number 2901, Source date 2/15/23.

5.0 PolyChlorinated Biphenyls (PCB)

5.1 Background and Protocol for PCBs

PolyChlorinated Biphenyls (PCB) are a group of manmade chemicals. PCBs were widely used in building materials and electrical products in the past. The U.S. Environmental Protection Agency banned the manufacturing and certain uses of PCBs in 1978, but buildings constructed or renovated between 1950 and 1978 may still have building materials and electrical products that contain PCBs. Examples of products that may contain PCBs include caulk, paint, glues, plastics, fluorescent lighting ballasts, transformers and capacitors.

PCBs are currently prohibited from being used in caulk and other commodities (U.S. EPA, 40 CFR 761). However, prior to 1977, PCBs were present in some caulking materials used in the construction of schools and other buildings. Studies have shown that concentrations of PCB can exceed 1% (10,000 ppm) by weight in some caulk materials. An investigation of 24 buildings in the Greater Boston Area revealed that one-third of the buildings tested (8 of 24) contained caulking materials with polychlorinated biphenyl (PCB) content exceeding 50 ppm by weight with an average concentration of 15,600 ppm or 1.5% (Herrick et al., 2004). These buildings included schools and other public buildings.

The U.S. EPA regulates the disposal of caulk, as well as soil and other materials contaminated with PCBs from caulk, if the concentration of PCBs exceeds 50 ppm. Such materials must be disposed at an appropriate approved or permitted facility.

U.S. EPA regulation 40 CFR 761 defines "PCB remediation waste" to include contaminated soil, and specifies a clean-up level of <1ppm without further conditions for unrestricted use in "high occupancy areas" (i.e., areas where individuals may be present for 335 hours or more per year). PCB caulk is defined as a PCB bulk product waste, and its disposal is subject to U.S. EPA regulations under the Toxic Substances Control Act (40 CFR761.62).

This protocol has been developed in consultation with the New York State Department of Health, Division of Environmental Health Assessment, Bureau of Toxic Substance Assessment to address concerns about properly managing caulk containing PCBs that will be disturbed during building renovation and maintenance.

CAULK SAMPLE COLLECTION

Buildings constructed or renovated between 1950 and 1977 have a potential to contain PCBs in existing caulk. Representative samples of caulking materials from these buildings prior to renovation or demolition work should be tested to determine whether the caulk is contaminated with PCBs. Professional judgement should be used to design the sampling plan for characterizing caulk throughout the building. The consultant should pay particular attention to construction and maintenance records and to the appearance of caulking materials (likenesses and differences). Samples should be taken from window frames or expansion joints that have not been repaired or replaced since 1977. Depending on specific information provided in the workplan developed by the project manager, such as window placement, compositing of some caulk samples might be appropriate. Caulk from different time periods or that have a different appearance should not be composited together.

It is important to note that caulk used during the time period of interest may also contain asbestos or lead. Therefore, the work plan should include testing, handling and disposal requirements appropriate for such regulated materials.

SOIL SAMPLE COLLECTION

Buildings constructed or renovated between 1950 and 1977, which have undergone further renovation after 1977, may have residual PCB contamination in adjacent soils. An adequate representation of surface soils should be tested to assess the potential for residual PCB contamination.

When designing a representative soil sampling plan, the likelihood of soil contamination from deteriorated or deteriorating caulk should be considered. Caulk that has in the past dried out and fallen to the ground is the most important source of soil contamination. Thus, sampling should include soil beneath windows where caulk has obviously deteriorated or been replaced because of previous deterioration. Areas subject to the stress of sun and prevailing weather (typically the southern and western side of each structure) should be included for sampling. These samples would provide a conservative evaluation of soil conditions due to an increased potential for material failure, possibly resulting in contamination of soil. Also, if earlier renovation or demolition work may have stockpiled potentially contaminated caulk in other school areas, the school should consider having soils in those areas tested as well.

Soil sampling should focus on areas of the building where ”banks” or “gangs” of windows exist/were replaced and areas of the structure where large expansion joints are located. This would provide a conservative evaluation of potential soil contamination and permit efficient sampling.

Any obvious pieces of caulk encountered during the collection of soil samples should be removed from the soil, categorized (with respect to location and depth) and treated as a separate potential sample.

Depth – At each soil sample location, soil should be collected in depth intervals of 0-2 inches, 2-6 inches and 6-12 inches. The surface soil sample (0-2 inches) should be collected from below the vegetative surface layer, if present.

Distance from Structure – Samples should be collected within 1 foot of the building and 5 feet from the building.

Samples should be collected in a manner that prevents cross-contamination. Augers or driven core samplers should be avoided, as any caulk caught on the edge of this type of tool could be driven to lower intervals. Using a designated trowel for each sample location and each interval of depth is encouraged. If the sampling tool is field cleaned between samples, do so in a manner that does not add solvent contamination to the environment.

NOTE
Sampling was performed by **Adelaide** in compliance with protocols outlined by New York State Education Department (NYSED) and USEPA 40 CFR 761, as described above. Only one sample per homogeneous area was required for analysis of suspect PCB-containing materials. Bulk sample(s) were properly packaged and forwarded, with associated Chain of Custody (COC), to a laboratory approved under the New York State Department of Health Environmental Laboratory Approval Program (NYSDOH ELAP), for analysis using method SW846-3550B/8082. The analysis will determine if the suspect material will be classified as PCB-containing at or above 50 ppm or mg/kg as per the EPA regulations. Copies of the analytical results are contained within attached appendices for review.

6.0 Mold

6.1 Applicable Standards/Guidelines for Mold

Effective July 28, 2015, Mold in New York State is regulated under the Labor Law Article 32, Sections 930-948, of the Official Compilation of Codes, Rules, and Regulations. Licensing of mold inspection, assessment and remediation specialists, and minimum work standards are covered within Article 32. A mold "project" is defined by this article as mold remediation, mold assessment, or mold abatement, of areas greater than ten square feet, but does not include (a) routine cleaning or (b) construction, maintenance, repair or demolition of buildings, structures or fixtures undertaken for purposes other than mold remediation or abatement.

Every mold cleanup project performed by professionals must follow these steps: 1) assessment/ remediation plan; 2) remediation/cleanup; and 3) clearance. Sections 945-947 of Article 32 detail the minimum work standards of these three (3) steps. **Additionally, regulations regarding asbestos, lead and/or other hazardous materials will apply if moldy building materials are disturbed by remediation activities.**

6.2 Mold Information & Sampling Methodology

Mold is a natural living organism with thousands of species. Mold can be different colors, and look fuzzy, slimy, or powdery. It often has a musty odor when present in large amounts. Mold requires three (3) things to grow: water/moisture, organic food source (ie. paper, fabric, sheetrock, etc.), and proper temperature. The presence of mold growth can be caused by plumbing leaks, leaking roofs or windows, high humidity, flooding, condensation due to poor ventilation or insulation, and more. To prevent mold growth from coming back in the future, the underlying source of moisture and humidity must be fixed.

Agencies such as the US Centers for Disease Control and Prevention, the Institute of Medicine of the US National Academy of Sciences, the World Health Organization, and Health Canada have recognized a relationship between living or working in damp buildings and the increased risk of respiratory disease due to the presence of mold. Studies by these agencies found that inhalation of mold spores may contribute to

adverse health effects including allergic reactions, asthma and other respiratory complaints. Sensitive populations such as the elderly, children and individuals with suppressed immune systems, are most susceptible to mold inhalation hazards. These sensitive populations may experience symptoms such as nasal stiffness, eye irritation, wheezing, or skin irritation. Acute reactions can include fever and shortness of breath. Individuals with a history of chronic lung disease could develop mold infections in their lungs such as Aspergillosis in rare instances. Everybody's reaction to being exposed to mold will be different. Consult a doctor to discuss symptoms being experienced.

Although NYS Labor Law Article 32 exist for training and licensing requirements, as well as minimum work standards, there are no regulatory thresholds/levels for mold. The establishment of a threshold or regulatory level cannot be justified scientifically with the information currently available. There are many unresolved issues related to air sampling and mold health effects that need additional research before a level can be set. Typically, professional judgment is employed to determine the most effective endpoint for a specific project.

Common principles for the assessment of indoor mold include: mold growth should not be tolerated on indoor building materials or furnishings; investigations and initial assessment should include a thorough visual; the extent of mold growth and water damage should be visually assessed and documented; and, to the extent possible, the source of the water/moisture intrusion which caused the mold growth should be identified. Although these general principles apply to all buildings, assessment techniques and remediation methods need to be adapted to the specific building and situation.

Primarily, a visual assessment of the building/structure, or portions thereof, affected by suspect mold growth, must be performed by a Licensed Mold Assessor. Although only a visual assessment is required, samples/readings can be collected at the discretion of the mold assessor to support visual findings. Building personnel are often the repository of all kinds of useful information not accessible elsewhere.

Adelaide uses Allergenco-D cassettes at 15.0L/min to sample airborne mold. Allergenco-D employs a patented laminar flow venturi which provided higher readable collection efficiency as well as a more well defined impaction trace, helping reduce analysis time. Samples of unused filters, handled in the same manner as the sample cassettes, are analyzed as blanks to ensure no contamination was from the process of taking the sample. In addition to analysis for mold spores, a wide range of airborne aerosols can be detected including pollen, insect parts, skin cell fragments, fibers, and inorganic particulates. After sampling is completed, the cassettes are sent to a laboratory, where the slides are removed, and direct microscopic analysis can be performed. The collection media is compatible with a wide range of biological stains and refractive index oils, allowing direct quantitative analysis of organic and inorganic particulate.

Along with air cassettes, Tape, swab and/or bulk samples collected are sent to the laboratory in a proper container. The sample(s) received by the laboratory are matched with the information provided on the Chain of Custody (COC). A laboratory Identification Number is assigned and the project and sample information is logged. Analysis begins with an inspection of the bulk material and any areas of discoloration or potential fungal presence are noted. Clear tape is used to take representative samples from the material and the tape(s) are reviewed microscopically and any detected fungi are identified, and estimated amounts are noted in our reporting system.

References:

a. New York State Labor Law Article 32, Sections 930-948 [2015]
b. American Industrial Hygiene Association (AIHA), *Facts about Mold.* [2011]
c. AIHA, *Recognition, Evaluation & Control of Indoor Mold (2nd edition)* [2020]
   Edited by Ling-Ling Hung, PhD; Steven M. Caulfield, PE, CIH, LEED AP;
   and J. David Miller, PhD, FAIHA.
d. AIHA, *The IAQ Investigator's Guide (3rd edition)* [2016]
   Edited by Ellen C. Gunderson, CIH, CSP.
e. The Institute of Inspection, Cleaning and Restoration Certification (IICRC), *ANSI/IICRC S520 Standard for Professional Mold Remediation (3rd edition).* [2015]

The Institute of Inspection, Cleaning and Restoration Certification (IICRC), *ANSI/IICRC S500 Standard for Professional Water Damage Restoration (5th edition).* [2021]

7.0 General Discussion

All construction personnel as well as individuals who have access to locations where asbestos-containing materials (ACM), lead-based paints (LBP) and/or polychlorinated biphenyls (PCB) exists should be informed of its presence and the proper work practices in these areas. Conspicuous labeling of all ACM is suggested to ensure personnel is adequately informed. Personnel should be informed not to rest, lean or store material or equipment on or near these surfaces and not to cut, saw, drill, sand or disturb ACM. All removal, disturbance, and repair of ACM should be performed in compliance with Title 12 NYCRR Part 56 by persons properly trained to handle ACM. Facility custodial and maintenance personnel should receive training commensurate with their work activities; as defined in 29 CFR 1910.1001.

8.0 Disclaimers

Adelaide certifies that the information contained within this report is based solely upon site observations and the results of laboratory analysis for samples collected during this survey/assessment. These observations and results are time dependent, subject to changing site conditions and revisions to Federal, State and Local regulations. **Adelaide** warrants that these findings have been promulgated after being prepared in general accordance with generally accepted practices in the abatement industries. **Adelaide** also recognizes that inspection laboratory data is not usually sufficient to make all abatement and management decisions. No other warranties are expressed or implied.

The materials sampled, as part of this survey, were limited to building materials potential affected by the provided scope of work only. All building materials outside the scope of work that have the potential to be disturbed, impacted, or if the scope of work is to change, are to be presumed asbestos-containing materials (PACM). Identified PACM **must** either be sampled by a licensed NYS Asbestos Inspector and/or abated/removed and disposed of by a licensed NYS Asbestos Abatement Contractor.

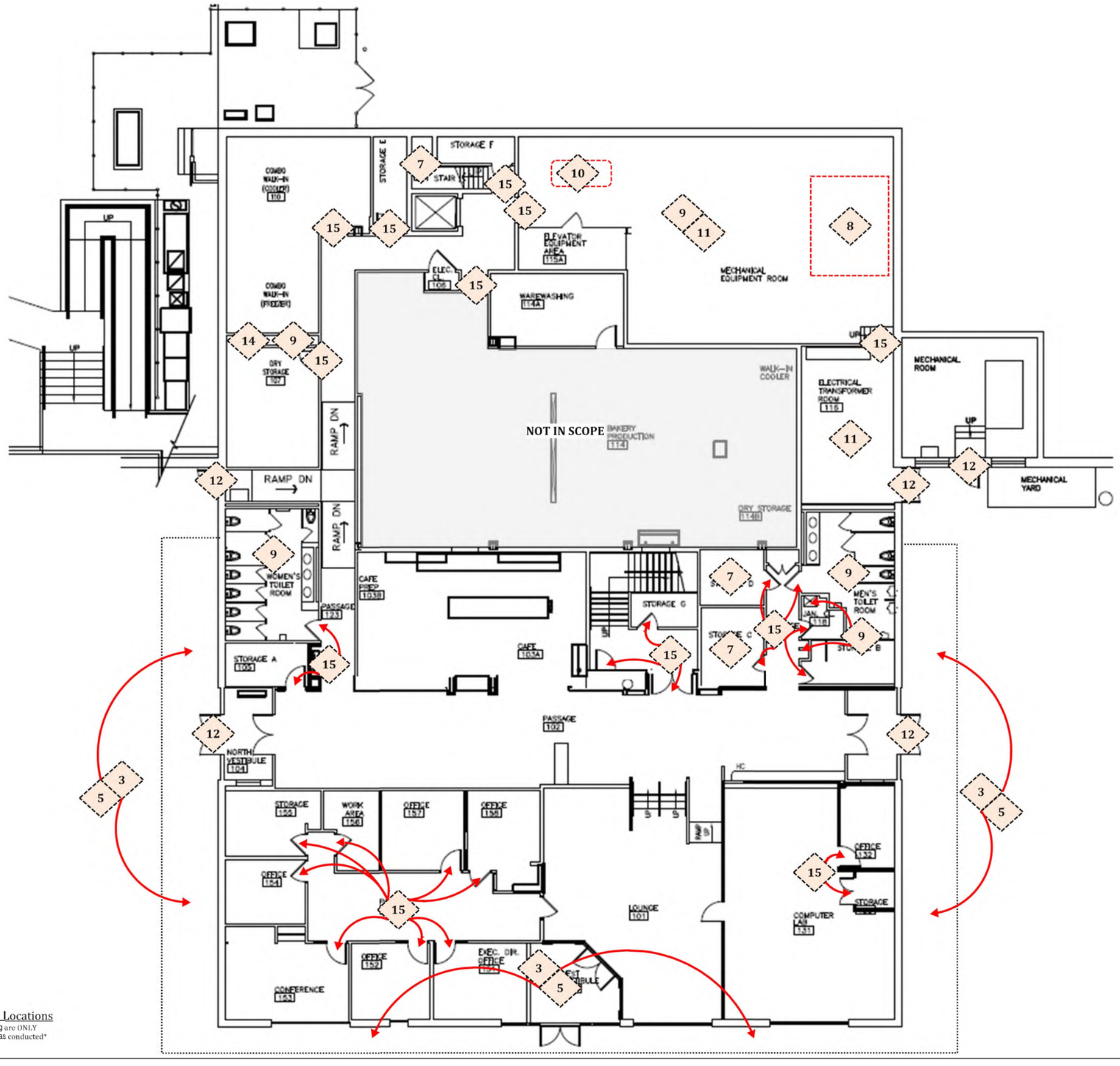
Due to the potential for concealed Asbestos-containing Materials (ACM) and/or other regulated materials, this report should not be construed to represent all ACM and/or regulated materials within the site(s). All quantities of ACM and/or other regulated materials identified, and all dimensions listed within this report are approximate and should be verified On-site.

This report is generated for the exclusive use of the client and is not designed to serve as a specification for abatement. The owner is strongly encouraged to contract with a consultant having a current Asbestos Project Designer Certificate as issued by New York State Department of Labor for the preparation of contract specifications, work plans, and/or drawings prior to requesting bids for the abatement or removal of the materials identified in this report.

NYSDOH issued an Interim Guidance Letter, on July 9, 2013, which outlined the approved testing alternative for materials containing vermiculite. Specifically, "...Where TSI, surfacing materials, or other PACM or miscellaneous suspect ACM contain greater than 10% vermiculite, Item 198.6 may be used to evaluate the asbestos content of the material; provided, however, that any test results using this method must be reported with the following conspicuous disclaimer: *"This method does not remove vermiculite and may underestimate the level of asbestos present in a sample containing greater than 10% vermiculite."* On July 22, 2014, NYSDOH issued a Regulatory Guidance Letter outlining the new approved analytical methods for testing sprayed-on fireproofing (SOFP) that contains vermiculite. NYSDOH authorized the use of ***two*** analytical methods to evaluate the asbestos content of SOFP that contains vermiculite. As per NYSDOH Guidelines, *"After October 31, 2014, one of the new methods **must** be used to test SOF-V, regardless of the percent of vermiculite."* On May 6, 2016, NYSDOH issued a Regulatory Guidance Letter outlining the new protocol for analytical procedure for surfacing materials (ie. plaster, stucco, etc.) that contain vermiculite. As per NYSDOH Guidelines, "*The original July 2013 and July 2014 letters addressed SOF-V only. Both NYS DOH's Item 198.8 and RJ Lee Group Method 055 shall now be applied to test for vermiculite in other Surfacing Material (SM) as defined in 12 NYCRR Part 56 (NYS Industrial Code Rule 56).*"

APPENDIX A

ACM LOCATION MAP(S)



First Floor Plan - Limited ACM Locations

ACM locations identified on this drawing are ONLY limited to the dates of the inspection that was conducted

Drawing Not to Scale

ACM LEGEND: (see report for details)	
1	Positive: Older Caulking at Louvers
2	Positive: HVAC Duct Insulation and Canvis Vibration Cloth
3	Positive: Tar Coated Light Wire
4	Positive: Older Lighting Wire
5	Positive: Transite Soffit
6	Positive: Interior Window Glazing Sealant
7	Positive: Floor Tile and Mastic
8	Positive: HVAC Pin Mastic
9	Positive: Mudded Fittings
10	Positive: Water Tank Insulation
11	Positive: Glue Daubs for Ceiling Block Material
12	Positive: Old Red Caulking
13	Positive: Waterproofing at Concrete Foundation
14	PACM: Spray-On Fireproofing on Beam
15	PACM: Fire Doors
16	PACM: Furnace Material/Components

Adelaide ENVIRONMENTAL HEALTH
1511 Route 22
Brewster, NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

CLIENT:
KSQ Design
215 West 40th Street,
15th Floor
New York, New York 10018

(Client) Project #
81056

SURVEY LOCATION:
SUNY New Paltz
Peregrine Dining Hall
1 Hawk Drive
New Paltz, New York 12561

DATE: 02/05/2024

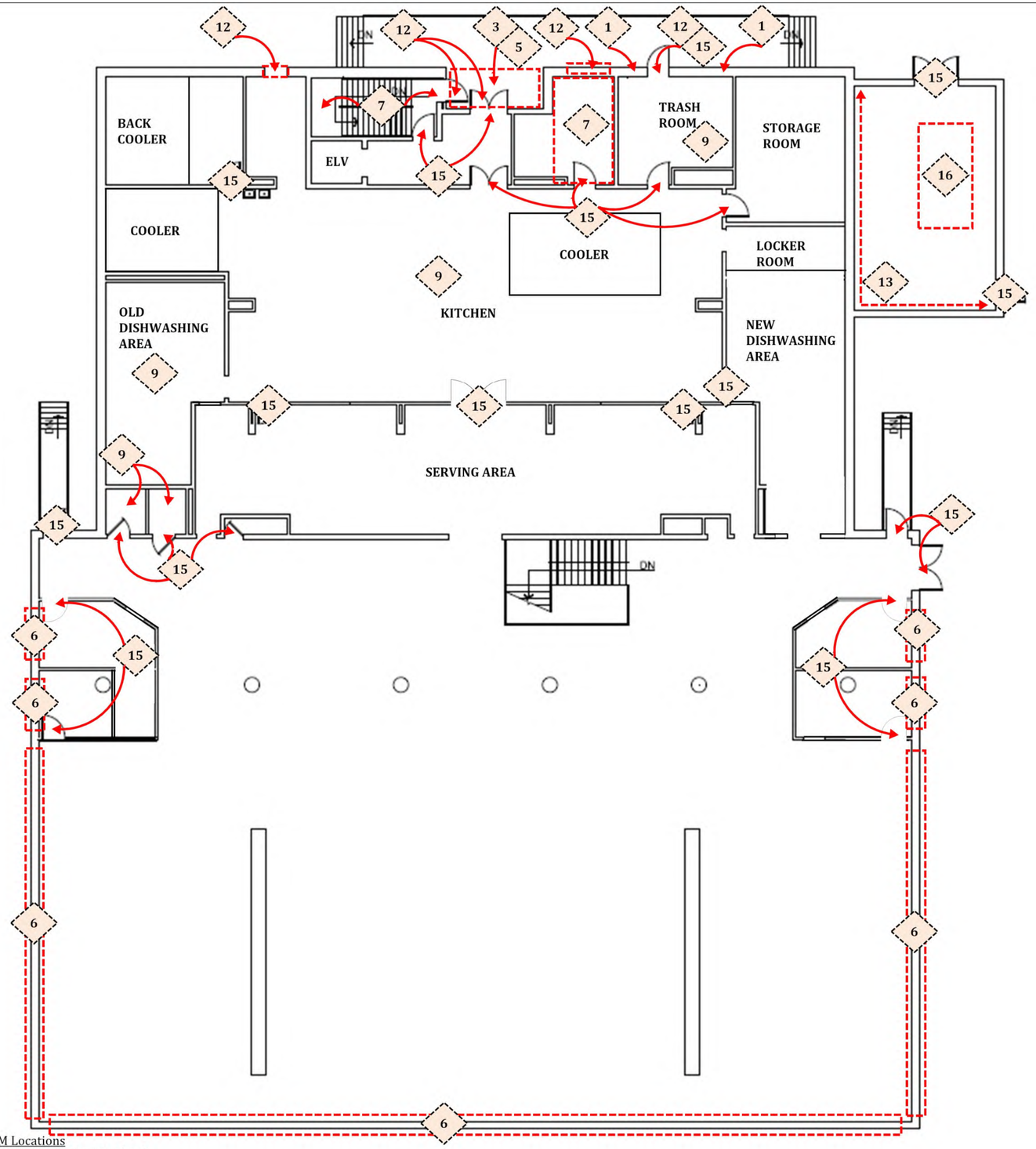
DRAWING VERSION: No. 2

ISSUED FOR:
Limited HazMat Survey

ADELAIDE PROJECT NO.:
KSQ:23261.00-IN

DRAWING PREPARED BY:
DWS

ASB-01



Second Floor Plan - Limited ACM Locations

ACM locations identified on this drawing are ONLY limited to the dates of the inspection that was conducted

Drawing Not to Scale

ACM LEGEND: (see report for details)	
1	Positive: Older Caulking at Louvers
2	Positive: HVAC Duct Insulation and Canvas Vibration Cloth
3	Positive: Tar Coated Light Wire
4	Positive: Older Lighting Wire
5	Positive: Transite Soffit
6	Positive: Interior Window Glazing Sealant
7	Positive: Floor Tile and Mastic
8	Positive: HVAC Pin Mastic
9	Positive: Mudded Fittings
10	Positive: Water Tank Insulation
11	Positive: Glue Daubs for Ceiling Block Material
12	Positive: Old Red Caulking
13	Positive: Waterproofing at Concrete Foundation
14	PACM: Spray-On Fireproofing on Beam
15	PACM: Fire Doors
16	PACM: Furnace Material/Components

Adelaide ENVIRONMENTAL HEALTH
1511 Route 22
Brewster, NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

CLIENT:
KSQ Design
215 West 40th Street,
15th Floor
New York, New York 10018

SUNY Project #
081056

SURVEY LOCATION:
SUNY New Paltz
Peregrine Dining Hall
1 Hawk Drive
New Paltz, New York 12561

DATE: 01/05/2023

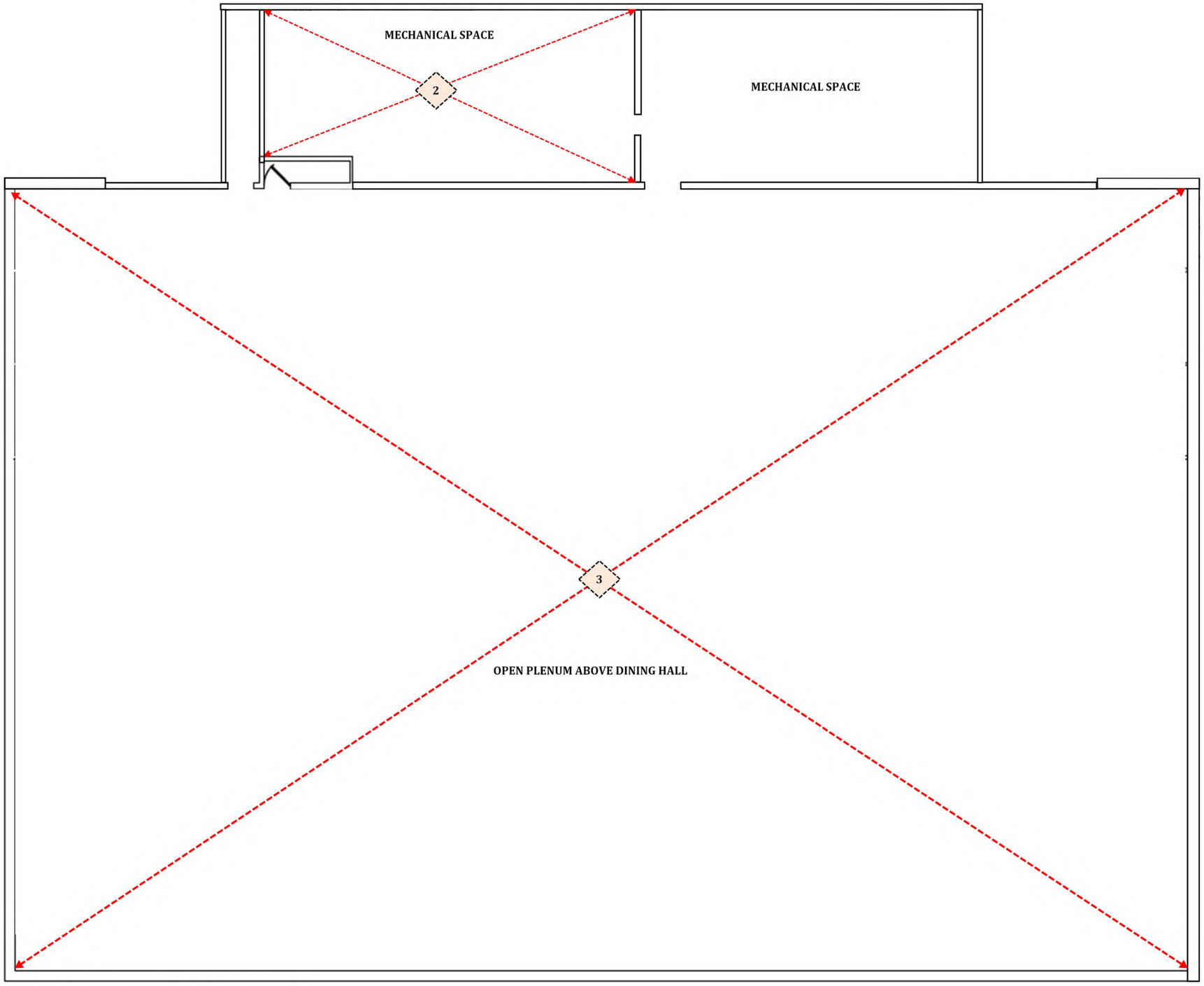
DRAWING VERSION: No. 1

ISSUED FOR:
Renovation HazMat Survey

ADELAIDE PROJECT NO.:
KSQ:23261.00-IN

DRAWING PREPARED BY:
DWS

ASB-02



Mezzanine Mechanical Floor Plan - Limited ACM Locations

ACM locations identified on this drawing are ONLY limited to the dates of the inspection that was conducted

Drawing Not to Scale

ACM LEGEND: (see report for details)	
1	Positive: Older Caulking at Louvers
2	Positive: HVAC Duct Insulation and Canvas Vibration Cloth
3	Positive: Tar Coated Light Wire
4	Positive: Older Lighting Wire
5	Positive: Transite Soffit
6	Positive: Window Glazing Sealant
7	Positive: Floor Tile and Mastic
8	Positive: HVAC Pin Mastic
9	Positive: Mudded Fittings
10	Positive: Water Tank Insulation
11	Positive: Glue Daubs for Ceiling Block Material
12	Positive: Old Red Caulking
13	Positive: Waterproofing at Concrete Foundation
14	PACM: Spray-On Fireproofing on Beam

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Fax: (845) 278-7750

CLIENT:
KSQ Design
215 West 40th Street,
15th Floor
New York, New York 10018

SUNY Project #
081056

SURVEY LOCATION:
SUNY New Paltz
Peregrine Dining Hall
1 Hawk Drive
New Paltz, New York 12561

DATE: 01/03/2023

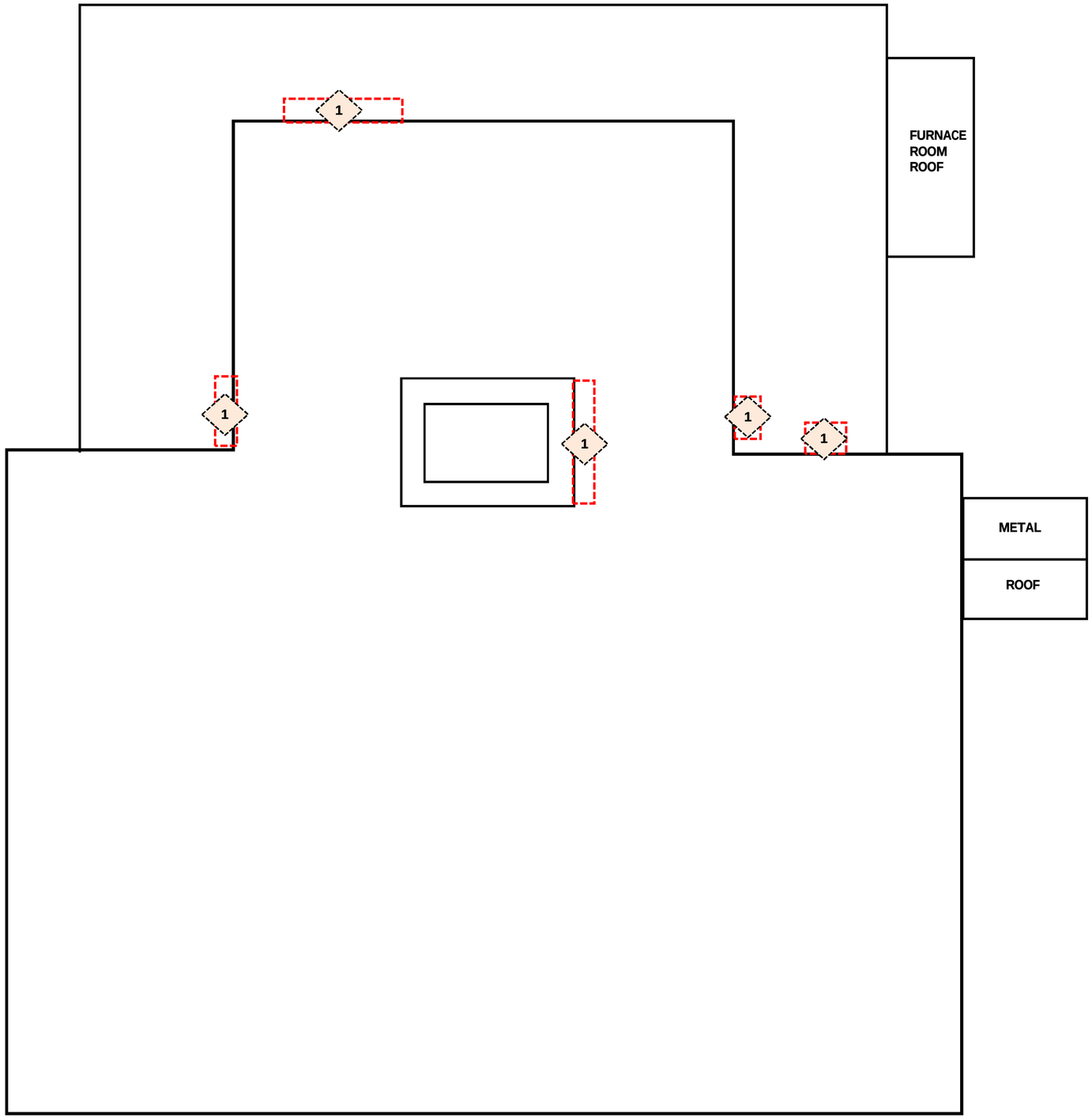
DRAWING VERSION: No. 1

ISSUED FOR:
Renovation HazMat Survey

ADELAIDE PROJECT NO.:
KSQ:23261.00-IN

DRAWING PREPARED BY:
DWS

ASB-03



Roof Plan - Limited ACM Locations

ACM locations identified on this drawing are ONLY limited to the dates of the inspection that was conducted

Drawing Not to Scale

ACM LEGEND: (see report for details)	
1	Positive: Older Caulking at Louvers
2	Positive: HVAC Duct Insulation and Canvas Vibration Cloth
3	Positive: Tar Coated Light Wire
4	Positive: Older Lighting Wire
5	Positive: Transite Soffit
6	Positive: Window Glazing Sealant
7	Positive: Floor Tile and Mastic
8	Positive: HVAC Pin Mastic
9	Positive: Mudded Fittings
10	Positive: Water Tank Insulation
11	Positive: Glue Daubs for Ceiling Block Material
12	Positive: Old Red Caulking
13	Positive: Waterproofing at Concrete Foundation
14	PACM: Spray-On Fireproofing on Beam

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15th Floor
New York, New York 10018

SUNY Project #
081056

SURVEY LOCATION:
SUNY New Paltz
Peregrine Dining Hall
1 Hawk Drive
New Paltz, New York 12561

DATE: 01/03/2023

DRAWING VERSION: No. 1

ISSUED FOR:
Renovation HazMat Survey

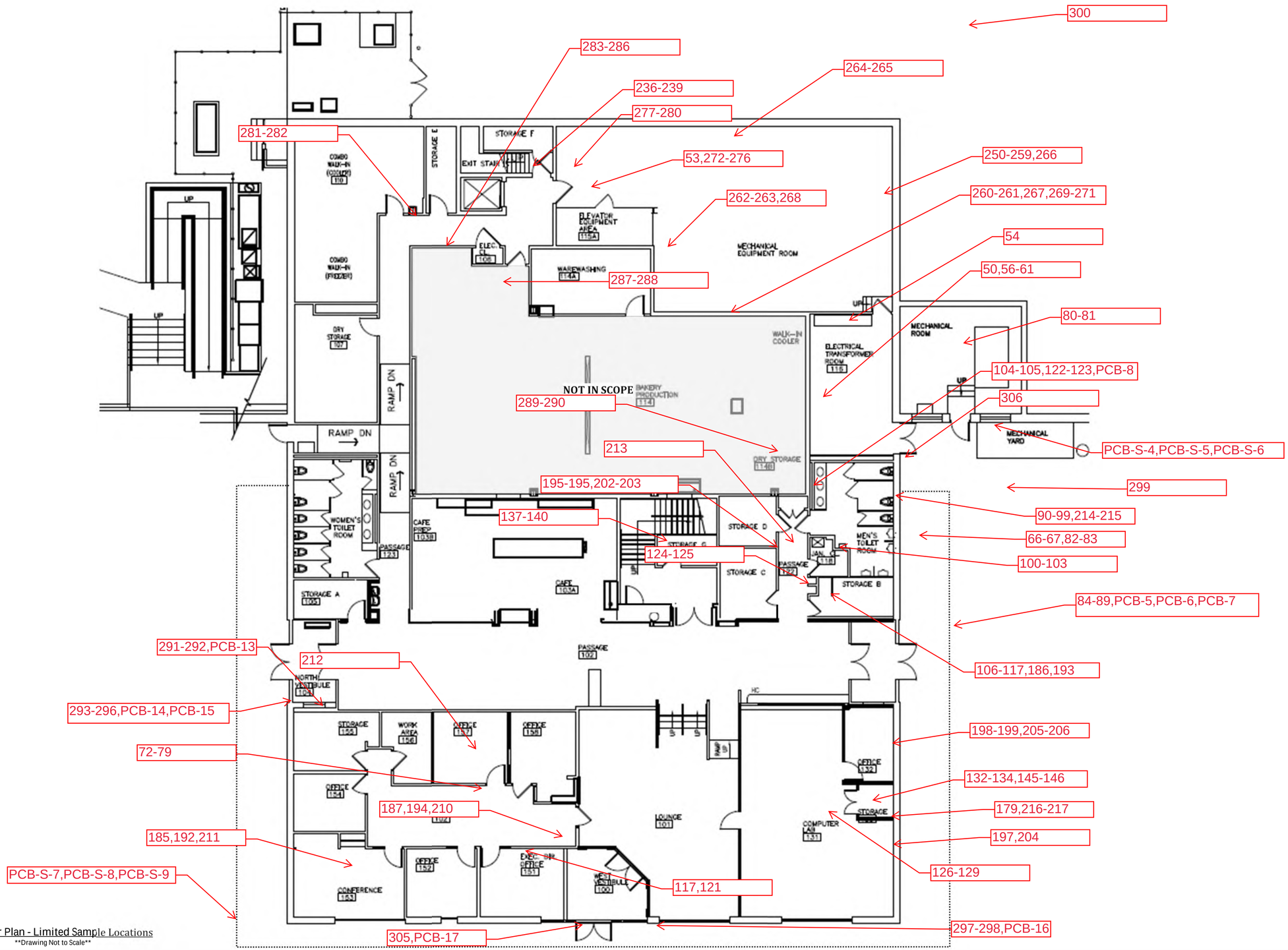
ADELAIDE PROJECT NO.:
KSQ:23261.00-IN

DRAWING PREPARED BY:
DWS

ASB-04

APPENDIX B

SAMPLE LOCATION MAP(S)



First Floor Plan - Limited Sample Locations

Drawing Not to Scale

Adelaide ENVIRONMENTAL HEALTH

1511 Route 22
Brewster, NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

CLIENT:
KSQ Design
215 West 40th Street,
15th Floor
New York, New York 10018

SUNY Project #
081056

SURVEY LOCATION:
SUNY New Paltz
Peregrine Dining Hall
1 Hawk Drive
New Paltz, New York 12561

DATE: 01/14/2023

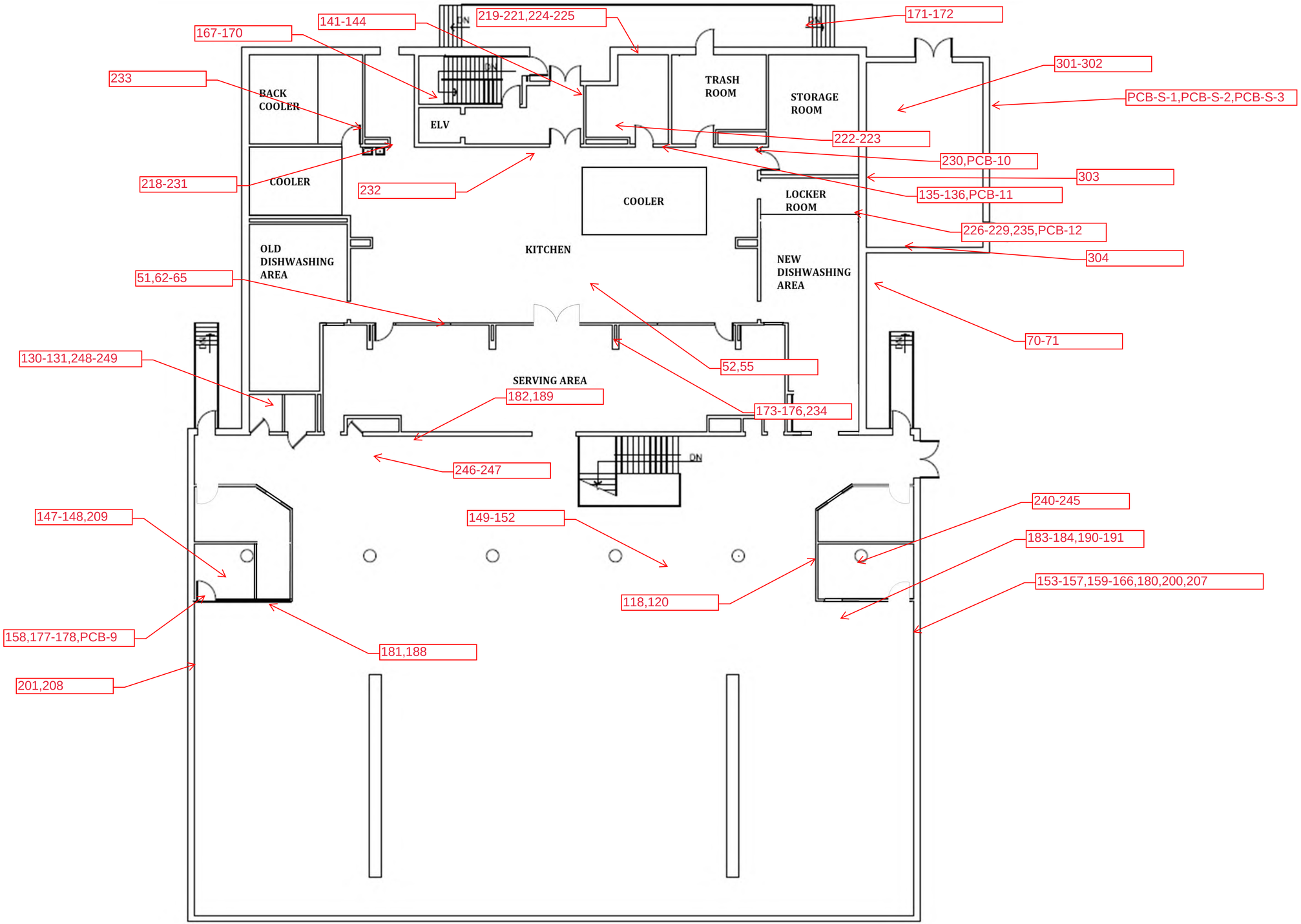
DRAWING VERSION: No. 1

ISSUED FOR:
Renovation HazMat Survey

ADELAIDE PROJECT NO.:
KSQ:23261.00-IN

DRAWING PREPARED BY:
DWS

SL-01



Second Floor Plan - Limited Sample Locations

Drawing Not to Scale

Adelaide ENVIRONMENTAL HEALTH

1511 Route 22
Brewster, NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

CLIENT:
KSQ Design
215 West 40th Street,
15th Floor
New York, New York 10018

SUNY Project #
081056

SURVEY LOCATION:
SUNY New Paltz
Peregrine Dining Hall
1 Hawk Drive
New Paltz, New York 12561

DATE: 01/14/2023

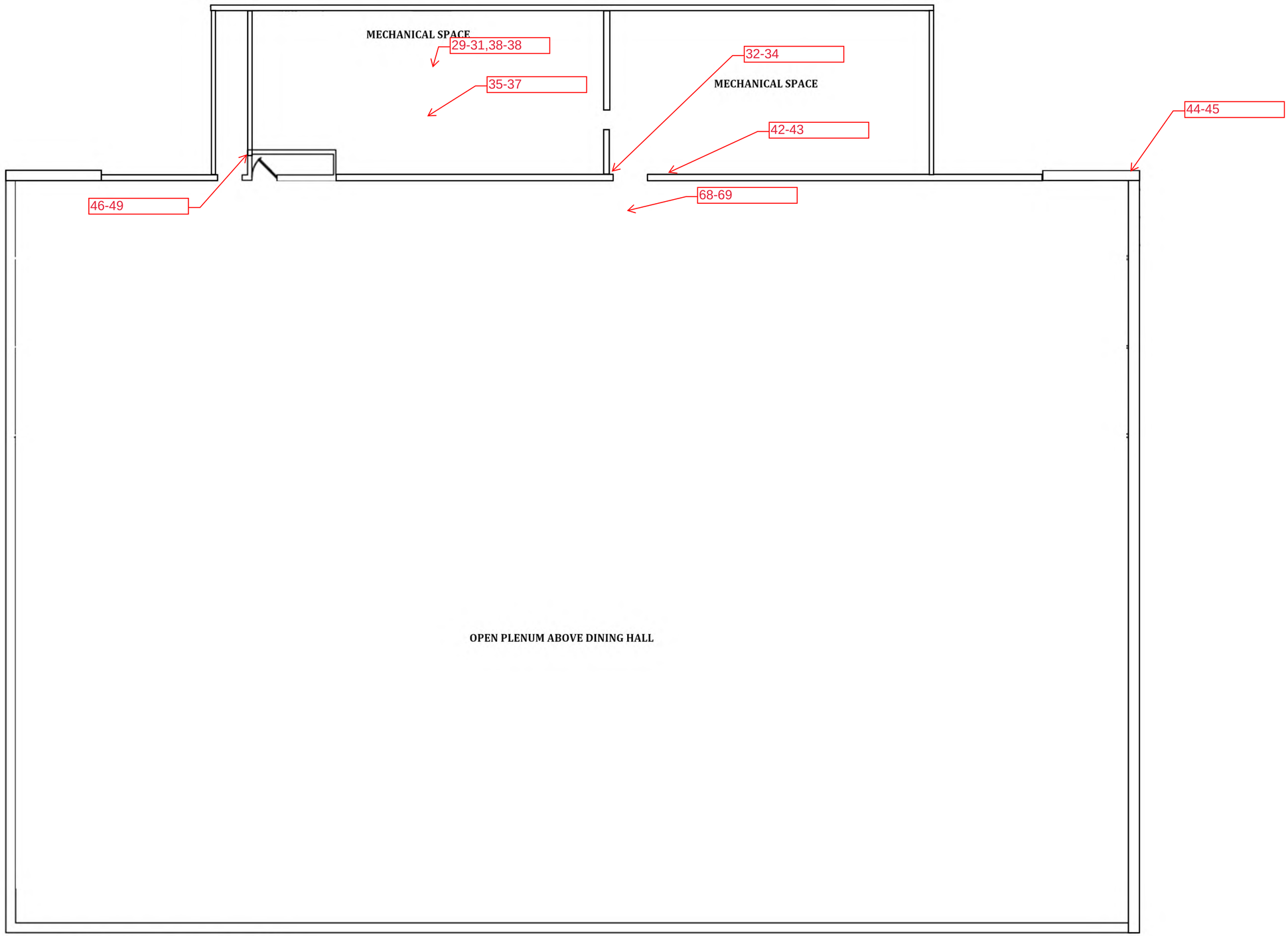
DRAWING VERSION: No. 1

ISSUED FOR:
Renovation HazMat Survey

ADELAIDE PROJECT NO.:
KSQ:23261.00-IN

DRAWING PREPARED BY:
DWS

SL-02



Mezzanine Mechanical Floor Plan - Limited Sample Locations
Drawing Not to Scale

Adelaide
ENVIRONMENTAL HEALTH
1511 Route 22
Brewster, NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

CLIENT:
KSQ Design
215 West 40th Street,
15th Floor
New York, New York 10018

SUNY Project #
081056

SURVEY LOCATION:
SUNY New Paltz
Peregrine Dining Hall
1 Hawk Drive
New Paltz, New York 12561

DATE: 01/14/2023

DRAWING VERSION: No. 1

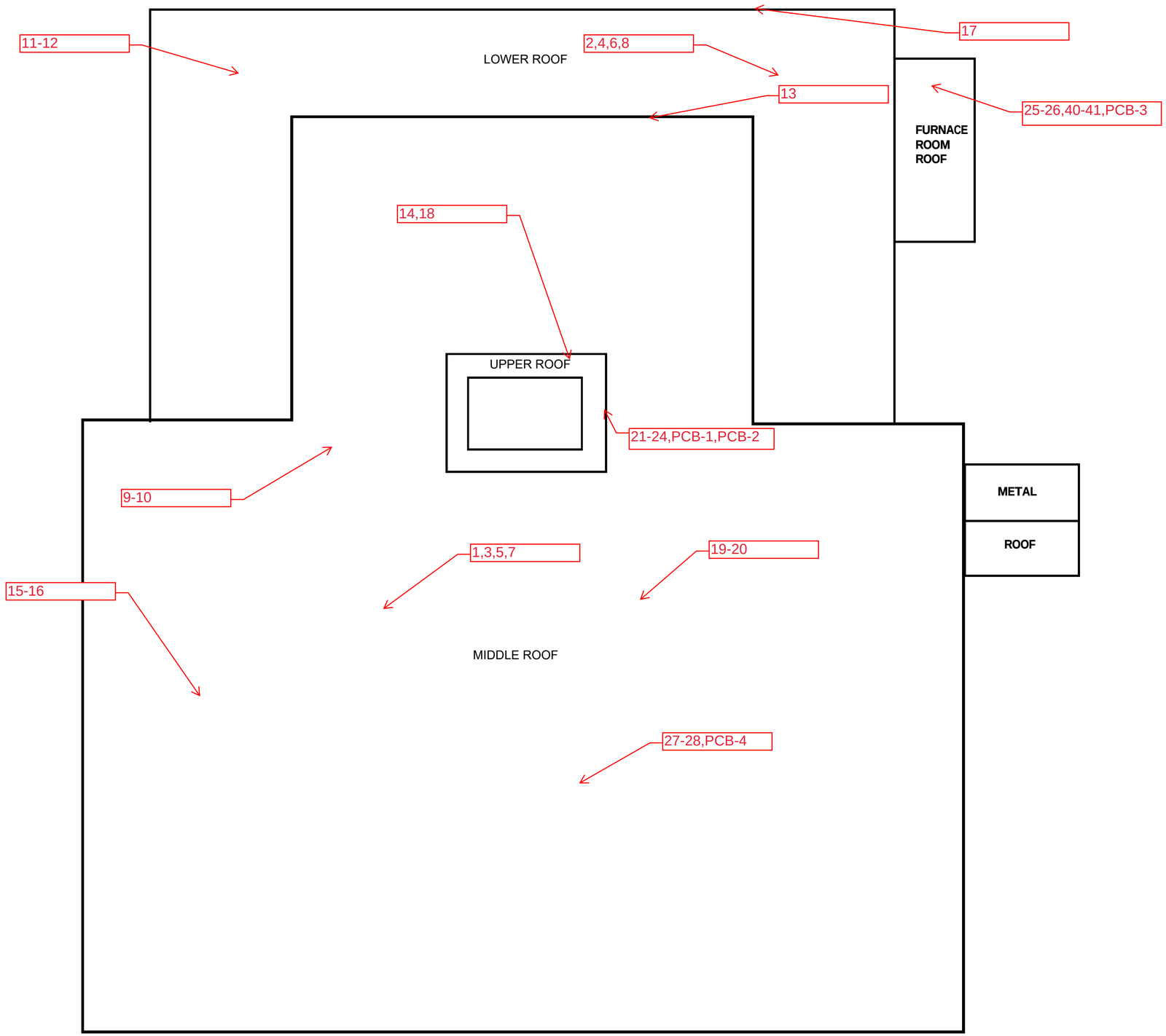
ISSUED FOR:

Renovation HazMat Survey

ADELAIDE PROJECT NO.:
KSQ:23261.00-IN

DRAWING PREPARED BY:
DWS

SL-03



Roof Plan - Sample Locations

Drawing Not to Scale

Adelaide ENVIRONMENTAL HEALTH
1511 Route 22
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Phone: (845) 278-7710
Fax: (845) 278-7750

CLIENT:
KSQ Design
215 West 40th Street,
15th Floor
New York, New York 10018

SUNY Project #
081056

SURVEY LOCATION:
SUNY New Paltz
Peregrine Dining Hall
1 Hawk Drive
New Paltz, New York 12561

DATE: 01/03/2023

DRAWING VERSION: No. 1

ISSUED FOR:
Renovation HazMat Survey

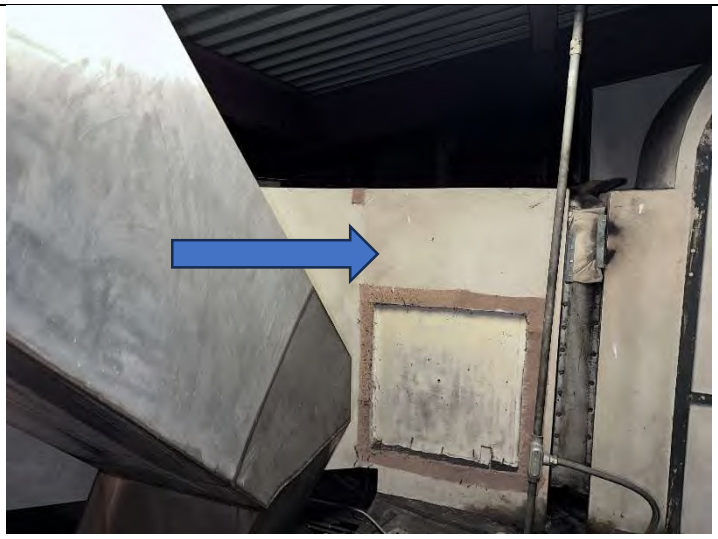
ADELAIDE PROJECT NO.:
KSQ:23261.00-IN

DRAWING PREPARED BY:
DWS

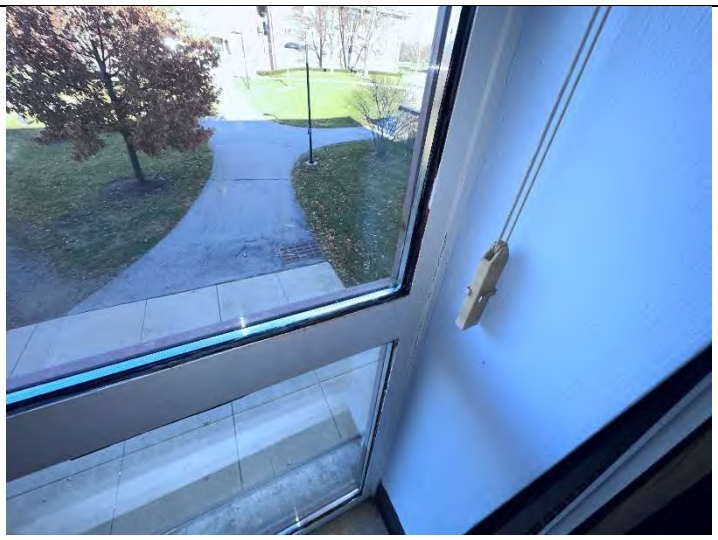
SL-04

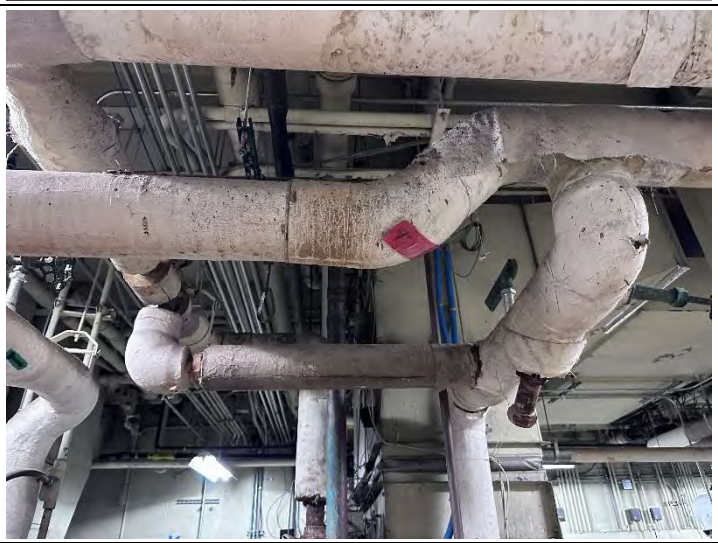
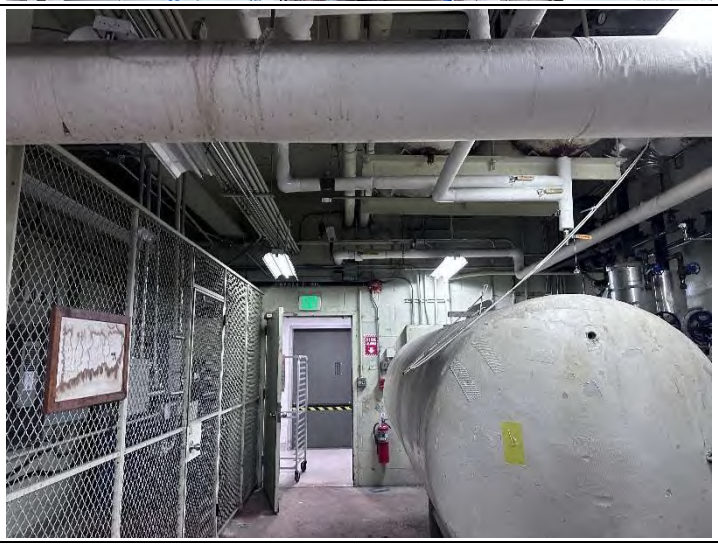
APPENDIX C

ACM / PCB / MOLD PHOTO(S)

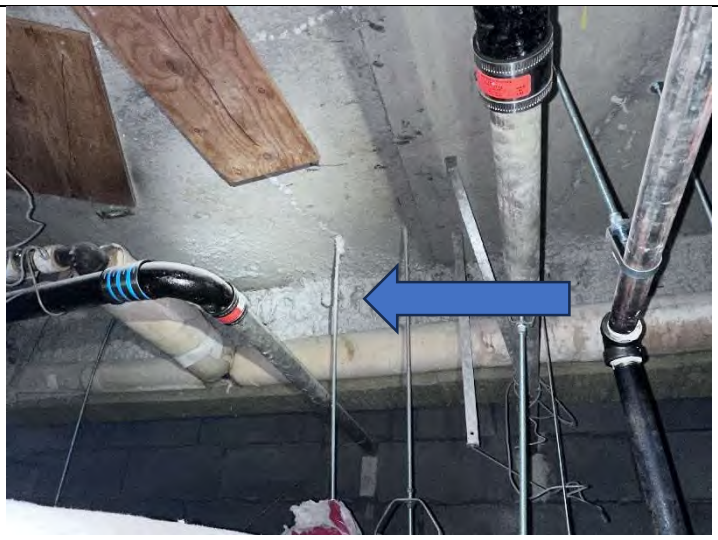
ACM PHOTOS	
HA 012 Picture Location Older Caulking at Louvers 1.7% of Anthophyllite	
HA 015 Picture Location HVAC Duct Insulation 40% of Chrysotile	
HA 018 Picture Location Canvis Vibration Cloth 16.3% of Chrysotile	

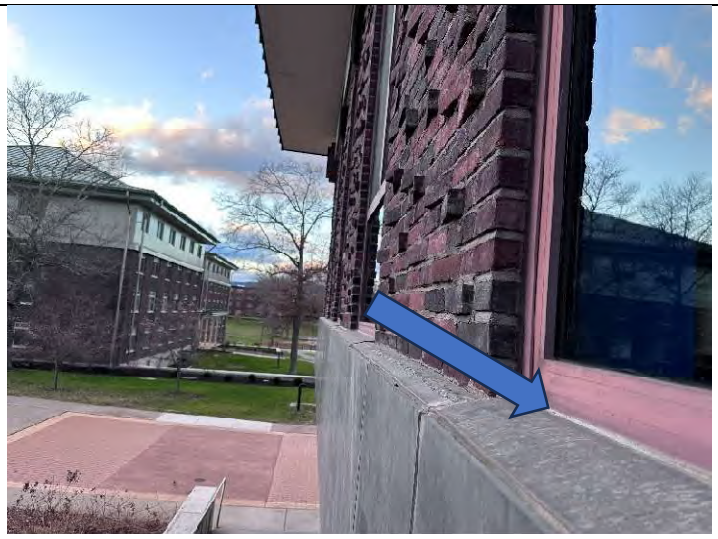
HA 032 Exterior Tar Coated Light Wire 19.5% of Chrysotile	
HA 033 Above Dining Room Ceiling Old Light Wire 23.5% of Chrysotile	
HA 082 Exterior Transite Soffit 12.1% of Chrysotile	

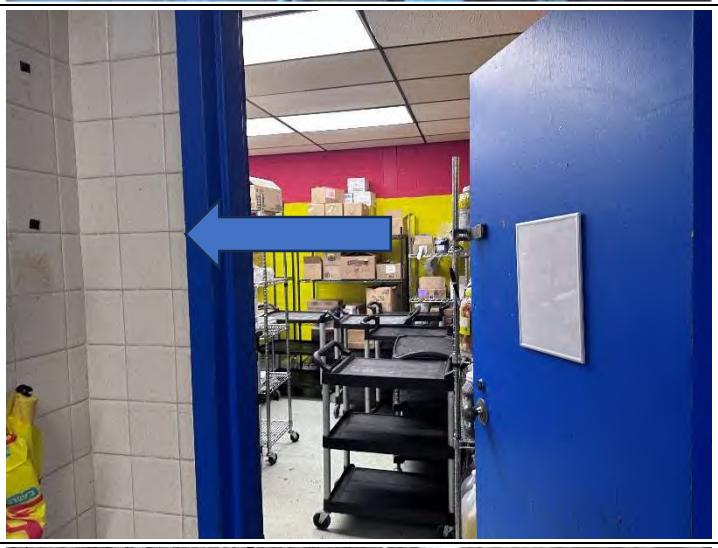
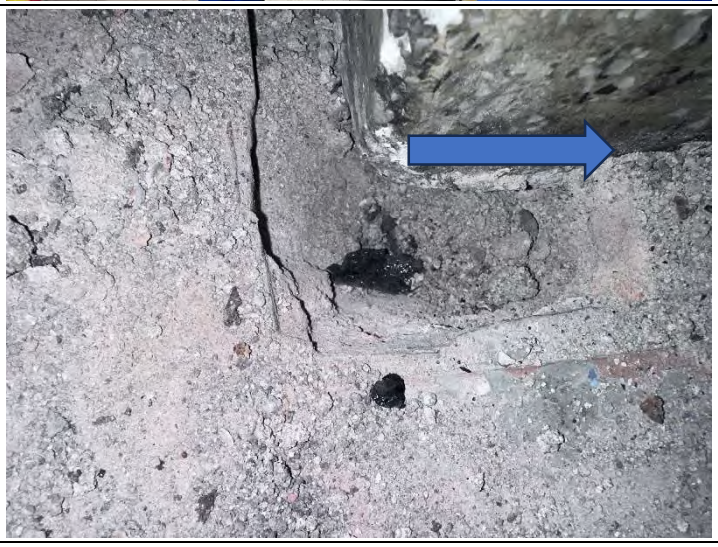
HA 066 Picture Location Window Glazing Sealant 3.9% of Chrysotile	
HA 082 & 083 Stairwell 9x9 Floor Tile and Mastic 7.7% of Chrysotile & 3.3% of Chrysotile	
HA 102 Picture Location Floor Tile and Mastic 2.6% of Chrysotile & 1.8% of Chrysotile	

HA 119 Basement Mechanical Room HVAC Pin Mastic 8.7% of Chrysotile	
HA 124 Picture Location Mudded Fittings 23.5% of Chrysotile	
HA 126 Basement Mechanical Room Water Tank Insulation 20.0% of Chrysotile & 6.7& of Amosite	

HA 129 Basement Mechanical Room Glue Daubs for Ceiling Block Material 7.0% of Chrysotile	
HA 138 Exterior Caulking Older Red 3.0% of Anthophyllite	
HA 142 Picture Location Waterproofing at Concrete Foundation 17.0% of Chrysotile	

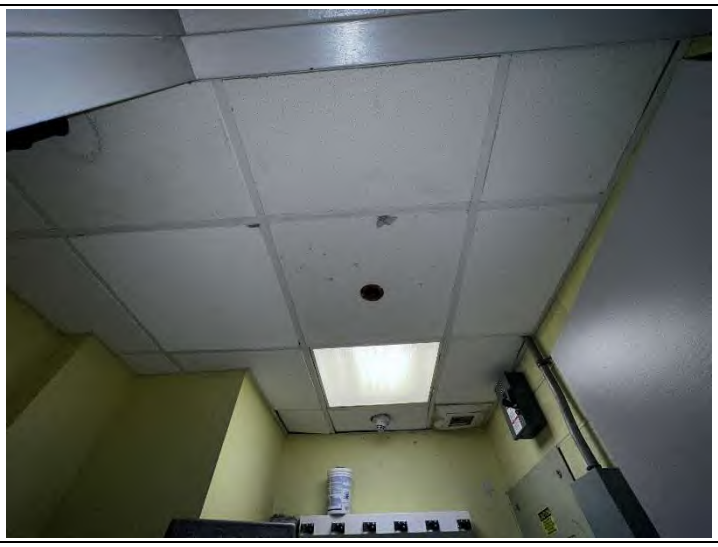
PACM Spray-On Fireproofing	
PACM Fire Door Insulation	
PACM Furnace Components	

PCB PHOTOS	
PCB-5 Exterior Caulking at Façade	
PCB-6 Exterior Caulking at Windowsill	
PCB-7 Exterior Caulking at Window	

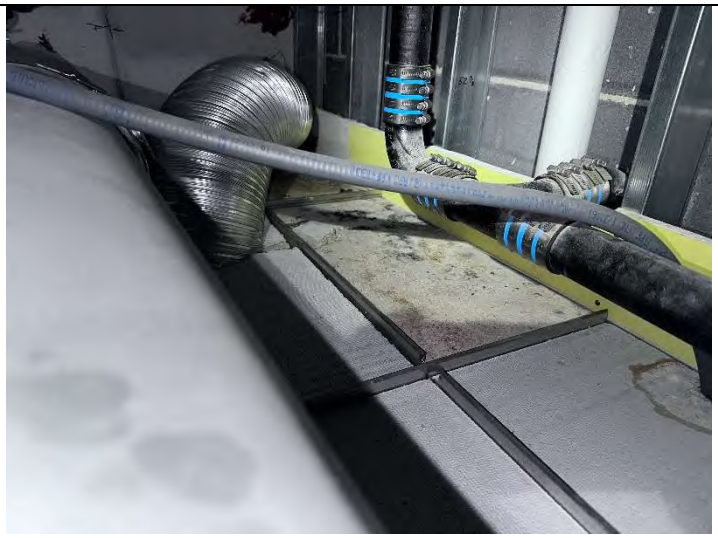
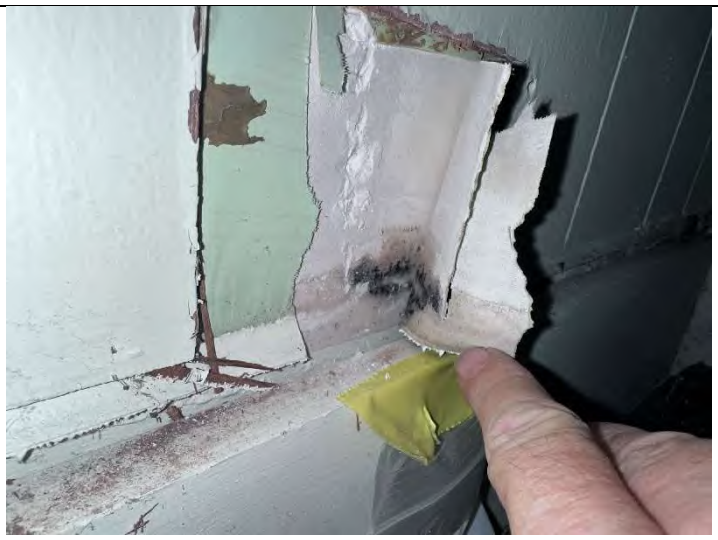
PCB-9 Dining Room and Offices Interior Window Glazing	
PCB-10 Original Door Frame Interior Cream Door Caulking	
PCB-12 Locker Room Gray Caulking at Terrazzo Sink Basin	

PCB-13 Vestibules Interior Gray Windo Glazing	
PCB in Soil Exterior – North West – under Louver	
PCB in Soil Exterior – North East – Plant Bed under Drip Line	

MOLD PHOTOS	
Computer Room Mold on Ceiling Tile	
Computer Room Mold on Ceiling Tile	
Computer Office Mold on Ceiling Tile	

Computer Storage Mold on Ceiling Tile	
Passageway (102) Mold on Sheetrock Ceiling	
Janitors Closet Mold on Ceiling Tile	

Dry Storage Mold on Ceiling Tile	
Dry Storage Mold on Wallpaper, Sheetrock/Plaster	
Bakery Area Mold on Ceiling Tile	

Bakery Area Mold on Sheetrock	
Ware Washing Area Topside of Ceiling Tiles	
Kitchen Managers Office Mold on Wallpaper/Plaster	

APPENDIX D

ASBESTOS ANALYTICAL RESULTS

Client Name: Adelaide Environmental Health

Table I
Summary of Bulk Asbestos Analysis Results

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1 Hawk Dr., New Paltz, NY 12561 - Client Project #81056

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	1	1	0.920	88.1	8.4	3.4	NAD	NAD
Location:	Roof - Upper Roof - Top Layer - Rolled Roofing							
02	2	1	0.253	66.8	25.8	7.4	NAD	NAD
Location:	Roof - Middle Roof - Top Layer - Rolled Roofing							
03	3	2	----	----	----	----	NAD	NA
Location:	Roof - Upper Roof - 2nd & 5th Layers - Dens Material Board							
04	4	2	----	----	----	----	NAD	NA
Location:	Roof - Middle Roof - 2nd & 5th Layers - Dens Material Board							
05	5	3	----	----	----	----	NAD	NA
Location:	Roof - Upper Roof - 3rd Layer - ISO Paper							
06	6	3	----	----	----	----	NAD	NA
Location:	Roof - Middle Roof - 3rd Layer - ISO Paper							
07	7	4	0.288	72.6	26.5	0.9	NAD	NAD
Location:	Roof - Upper Roof - 4th Layer - Vapor Barrier Material							
08	8	4	0.272	71.6	26.2	2.2	NAD	NAD
Location:	Roof - Middle Roof - 4th Layer - Vapor Barrier Material							
09	9	5	0.320	63.1	0.1	36.9	NAD	NAD
Location:	Roof - Upper Roof - Repair Material							
10	10	5	0.264	62.3	4.3	33.4	NAD	NAD
Location:	Roof - Upper Roof - Repair Material							
11	11	6	0.252	62.5	26.6	10.9	NAD	NAD
Location:	Roof - Lower Roof - Tar On Exhaust Unit							
12	12	6	0.304	60.3	23.4	16.3	NAD	NAD
Location:	Roof - Lower Roof - Tar On Exhaust Unit							
13	13	7	0.142	69.3	4.4	26.3	NAD	NAD
Location:	Roof - Lower Roof - Tar @ Wall On Bricks							
14	14	7	0.159	85.8	2.6	11.6	NAD	NAD
Location:	Roof - Middle Roof - Tar @ Wall On Bricks							
15	15	8	0.245	74.0	25.2	0.9	NAD	NAD
Location:	Roof - Middle Roof - Roof Drain Tar							
16	16	8	0.273	70.0	28.9	1.1	NAD	NAD
Location:	Roof - Middle Roof - Roof Drain Tar							

See Reporting notes on last page

Client Name: Adelaide Environmental Health

Table I
Summary of Bulk Asbestos Analysis Results

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1 Hawk Dr., New Paltz, NY 12561 - Client Project #81056

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	17	9	----	----	----	----	NAD	NA
Location:	Roof - Upper Roof - @ Edge - Perlite Cant Board							
18	18	9	----	----	----	----	NAD	NA
Location:	Roof - Middle Roof - @ Wall - Perlite Cant Board							
19	19	10	0.159	72.4	14.9	12.7	NAD	NAD
Location:	Roof - Middle Roof - Pitch Pocket Material							
20	20	10	0.296	72.5	11.9	15.6	NAD	NAD
Location:	Roof - Middle Roof - Pitch Pocket Material							
21	21	11	0.175	27.2	66.7	6.1	NAD	NAD
Location:	Roof - Middle Roof - Caulk @ Louver - Newer							
22	22	11	0.234	27.2	71.3	1.5	NAD	NAD
Location:	Roof - Middle Roof - Caulk @ Louver - Newer							
23	23	12	0.256	23.3	15.8	59.2	Anthophyllite 1.7	NA
Location:	Roof - Middle Roof - Caulk @ Louver - Older							
24	24	12	0.242	22.9	12.8	64.3	NA/PS	NA
Location:	Roof - Middle Roof - Caulk @ Louver - Older							
25	25	13	0.144	65.1	4.5	30.4	NAD	NAD
Location:	Roof - Furnace Room Roof - Caulking @ Exh. Pipe							
26	26	13	0.200	62.1	1.4	36.4	NAD	NAD
Location:	Roof - Furnace Room Roof - Caulking @ Exh. Pipe							
27	27	14	0.140	96.6	0.2	3.2	NAD	NAD
Location:	Roof - Middle Roof - Caulking @ Exhaust Unit							
28	28	14	0.180	98.2	0.6	1.2	NAD	NAD
Location:	Roof - Middle Roof - Caulking @ Exhaust Unit							
29	29	15	----	----	----	----	Chrysotile 40.0	NA
Location:	Mez. - Mechanical Room - HVAC Insulation On Duct							
30	30	15	----	----	----	----	NA/PS	NA
Location:	Mez. - Mechanical Room - HVAC Insulation On Duct							
31	31	15	----	----	----	----	NA/PS	NA
Location:	Mez. - Mechanical Room - HVAC Insulation On Duct							
32	32	16	----	----	----	----	Chrysotile 0.5	NA
Location:	Mez. - Mechanical Room - Mudded Fitting For Roof Drain Pipe							

See Reporting notes on last page

Client Name: Adelaide Environmental Health

Table I
Summary of Bulk Asbestos Analysis Results

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1 Hawk Dr., New Paltz, NY 12561 - Client Project #81056

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
33	33	16	----	----	----	----	Chrysotile 0.3	NA
Location: Mez. - Mechanical Room - Mudded Fitting For Roof Drain Pipe								
34	34	16	----	----	----	----	Chrysotile 0.3	NA
Location: Mez. - Mechanical Room - Mudded Fitting For Roof Drain Pipe								
35	35	17	----	----	----	----	NAD	NA
Location: Mez. - Mechanical Room - HVAC Duct - Cloth Wrap								
36	36	17	----	----	----	----	NAD	NA
Location: Mez. - Mechanical Room - HVAC Duct - Cloth Wrap								
37	37	17	----	----	----	----	NAD	NA
Location: Mez. - Mechanical Room - HVAC Duct - Cloth Wrap								
38	38	18	0.216	61.8	5.7	16.3	Chrysotile 16.3	NA
Location: Mez. - Mechanical Room - HVAC - Vibration Cloth								
39	39	18	0.173	59.7	6.2	34.1	NA/PS	NA
Location: Mez. - Mechanical Room - HVAC - Vibration Cloth								
40	40	19	0.365	14.7	33.1	52.2	NAD	NAD
Location: Roof - Furnace Room Roof - Tar On Concrete Deck & Concrete								
41	41	19	0.430	11.4	36.3	52.3	NAD	NAD
Location: Roof - Furnace Room Roof - Tar On Concrete Deck & Concrete								
42	42	20	----	----	----	----	NAD	NA
Location: Mez. - Mechanical Room - Wall Material								
43	43	20	----	----	----	----	NAD	NA
Location: Mez. - Mechanical Room - Wall Material								
44	44	21	----	----	----	----	NAD	NA
Location: Ext. - Exterior - Brick Material								
45	45	21	----	----	----	----	NAD	NA
Location: Ext. - Exterior - Brick Material								
46	46	22	----	----	----	----	NAD	NA
Location: Mez. - Mechanical Room - CMU								
47	47	22	----	----	----	----	NAD	NA
Location: Mez. - Mechanical Room - CMU								
48	48	23	----	----	----	----	NAD	NA
Location: Mez. - Mechanical Room - CMU Mortar								

See Reporting notes on last page

Client Name: Adelaide Environmental Health

Table I
Summary of Bulk Asbestos Analysis Results

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1 Hawk Dr., New Paltz, NY 12561 - Client Project #81056

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
49	49	23	----	----	----	----	NAD	NA

Location: Mez. - Mechanical Room - CMU Mortar

Analyzed by: Khaalid W. Perine
Date: 11/29/2023

Reviewed by: Karol H. Lu

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H600-Noran 7 System, Microscope, Serial #: 600-27-6. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Adelaide Environmental Health
Attn: John Soter
1511 Rte. 22 Suite C24

Brewster, NY 10509

Date Received 11/28/23
Date Examined 11/28/23
ELAP # 11480

AmeriSci Job # 223113115
P.O. #
Page 1 **of** 9

RE: KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1 Hawk Dr., New Paltz, NY 12561 - Client Project #81056

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
1 1	223113115-01 **Location:** Roof - Upper Roof - Top Layer - Rolled Roofing **Analyst Description:** Gray/Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.4%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
2 1	223113115-02 **Location:** Roof - Middle Roof - Top Layer - Rolled Roofing **Analyst Description:** Gray/Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 7.4%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
3 2	223113115-03 **Location:** Roof - Upper Roof - 2nd & 5th Layers - Dens Material Board **Analyst Description:** Brown/Gray, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 30%, Non-fibrous 70%	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23
4 2	223113115-04 **Location:** Roof - Middle Roof - 2nd & 5th Layers - Dens Material Board **Analyst Description:** Brown/Gray, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 30%, Non-fibrous 70%	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23
5 3	223113115-05 **Location:** Roof - Upper Roof - 3rd Layer - ISO Paper **Analyst Description:** Gray/Yellow, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 70%, Fibrous glass 5%, Non-fibrous 25%	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1
Hawk Dr., New Paltz, NY 12561 - Client Project #81056

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
6 3	223113115-06 **Location:** Roof - Middle Roof - 3rd Layer - ISO Paper **Analyst Description:** Gray/Yellow, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 75%, Fibrous glass 5%, Non-fibrous 20%	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23
7 4	223113115-07 **Location:** Roof - Upper Roof - 4th Layer - Vapor Barrier Material **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.9%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
8 4	223113115-08 **Location:** Roof - Middle Roof - 4th Layer - Vapor Barrier Material **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.2%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
9 5	223113115-09 **Location:** Roof - Upper Roof - Repair Material **Analyst Description:** Gray/Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 36.9%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
10 5	223113115-10 **Location:** Roof - Upper Roof - Repair Material **Analyst Description:** Gray/Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 33.4%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
11 6	223113115-11 **Location:** Roof - Lower Roof - Tar On Exhaust Unit **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 10.9%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1
Hawk Dr., New Paltz, NY 12561 - Client Project #81056

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
12 6	223113115-12 **Location:** Roof - Lower Roof - Tar On Exhaust Unit **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 16.3%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
13 7	223113115-13 **Location:** Roof - Lower Roof - Tar @ Wall On Bricks **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 26.3%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
14 7	223113115-14 **Location:** Roof - Middle Roof - Tar @ Wall On Bricks **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 11.6%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
15 8	223113115-15 **Location:** Roof - Middle Roof - Roof Drain Tar **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.9%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
16 8	223113115-16 **Location:** Roof - Middle Roof - Roof Drain Tar **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1.1%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
17 9	223113115-17 **Location:** Roof - Upper Roof - @ Edge - Perlite Cant Board **Analyst Description:** Brown, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 45%, Non-fibrous 55%	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1
Hawk Dr., New Paltz, NY 12561 - Client Project #81056

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
18 9	223113115-18 **Location:** Roof - Middle Roof - @ Wall - Perlite Cant Board **Analyst Description:** Brown, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 60%, Non-fibrous 40%	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23
19 10	223113115-19 **Location:** Roof - Middle Roof - Pitch Pocket Material **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 12.7%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
20 10	223113115-20 **Location:** Roof - Middle Roof - Pitch Pocket Material **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 15.6%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
21 11	223113115-21 **Location:** Roof - Middle Roof - Caulk @ Louver - Newer **Analyst Description:** Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 6.1%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
22 11	223113115-22 **Location:** Roof - Middle Roof - Caulk @ Louver - Newer **Analyst Description:** Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1.5%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
23 12	223113115-23 **Location:** Roof - Middle Roof - Caulk @ Louver - Older **Analyst Description:** Pink/Brown, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Anthophyllite 1.7 % **Other Material:** Fibrous Talc 10%, Non-fibrous 49.2%	***Yes***	1.7% [1] (ELAP 400 PC) by Valeriu Voicu on 11/28/23

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1
Hawk Dr., New Paltz, NY 12561 - Client Project #81056

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
24 12	223113115-24 **Location:** Roof - Middle Roof - Caulk @ Louver - Older **Analyst Description:** Bulk Material **Asbestos Types:** **Other Material:**		NA/PS
25 13	223113115-25 **Location:** Roof - Furnace Room Roof - Caulking @ Exh. Pipe **Analyst Description:** Gray/Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 30.4%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
26 13	223113115-26 **Location:** Roof - Furnace Room Roof - Caulking @ Exh. Pipe **Analyst Description:** Gray/Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 36.4%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
27 14	223113115-27 **Location:** Roof - Middle Roof - Caulking @ Exhaust Unit **Analyst Description:** Clear, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.2%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
28 14	223113115-28 **Location:** Roof - Middle Roof - Caulking @ Exhaust Unit **Analyst Description:** Clear, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1.2%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
29 15	223113115-29 **Location:** Mez. - Mechanical Room - HVAC Insulation On Duct **Analyst Description:** Lt. Gray, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 40.0 % **Other Material:** Non-fibrous 60%	***Yes***	40% (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23

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PLM Bulk Asbestos Report

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1
Hawk Dr., New Paltz, NY 12561 - Client Project #81056

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
30 15	223113115-30 **Location:** Mez. - Mechanical Room - HVAC Insulation On Duct		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			
31 15	223113115-31 **Location:** Mez. - Mechanical Room - HVAC Insulation On Duct		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			
32 16	223113115-32 **Location:** Mez. - Mechanical Room - Mudded Fitting For Roof Drain Pipe	***Yes***	0.5% (ELAP 400 PC) by Valeriu Voicu on 11/28/23
Analyst Description: Gray, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 0.5 % **Other Material:** Cellulose Trace, Fibrous glass 15%, Non-fibrous 84.5%			
33 16	223113115-33 **Location:** Mez. - Mechanical Room - Mudded Fitting For Roof Drain Pipe	***Yes***	0.3% (ELAP 400 PC) by Valeriu Voicu on 11/28/23
Analyst Description: Gray, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 0.3 % **Other Material:** Fibrous glass 15%, Non-fibrous 84.7%			
34 16	223113115-34 **Location:** Mez. - Mechanical Room - Mudded Fitting For Roof Drain Pipe	***Yes***	0.3% (ELAP 400 PC) by Valeriu Voicu on 11/28/23
Analyst Description: Gray, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 0.3 % **Other Material:** Cellulose Trace, Fibrous glass 20%, Non-fibrous 79.7%			
35 17	223113115-35 **Location:** Mez. - Mechanical Room - HVAC Duct - Cloth Wrap	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23
Analyst Description: Tan/Gray, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 80%, Non-fibrous 20%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1
Hawk Dr., New Paltz, NY 12561 - Client Project #81056

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
36 17	223113115-36 **Location:** Mez. - Mechanical Room - HVAC Duct - Cloth Wrap	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23
Analyst Description: Tan/Gray, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 75%, Non-fibrous 25%			
37 17	223113115-37 **Location:** Mez. - Mechanical Room - HVAC Duct - Cloth Wrap	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23
Analyst Description: Tan/Gray, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 80%, Non-fibrous 20%			
38 18	223113115-38 **Location:** Mez. - Mechanical Room - HVAC - Vibration Cloth	***Yes***	16.3% (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Silver/Black, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 16.3 % **Other Material:** Non-fibrous 16.2%			
39 18	223113115-39 **Location:** Mez. - Mechanical Room - HVAC - Vibration Cloth		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			
40 19	223113115-40 **Location:** Roof - Furnace Room Roof - Tar On Concrete Deck & Concrete	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Black/Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 52.2%			
41 19	223113115-41 **Location:** Roof - Furnace Room Roof - Tar On Concrete Deck & Concrete	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Black/Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 52.3%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1
Hawk Dr., New Paltz, NY 12561 - Client Project #81056

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
42 20	223113115-42 **Location:** Mez. - Mechanical Room - Wall Material **Analyst Description:** Brown, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 30%, Non-fibrous 70%	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23
43 20	223113115-43 **Location:** Mez. - Mechanical Room - Wall Material **Analyst Description:** Brown, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 35%, Non-fibrous 65%	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23
44 21	223113115-44 **Location:** Ext. - Exterior - Brick Material **Analyst Description:** Dark Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23
45 21	223113115-45 **Location:** Ext. - Exterior - Brick Material **Analyst Description:** Dark Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23
46 22	223113115-46 **Location:** Mez. - Mechanical Room - CMU **Analyst Description:** Dark Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23
47 22	223113115-47 **Location:** Mez. - Mechanical Room - CMU **Analyst Description:** Dark Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1
Hawk Dr., New Paltz, NY 12561 - Client Project #81056

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
48 23	223113115-48 **Location:** Mez. - Mechanical Room - CMU Mortar	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%			
49 23	223113115-49 **Location:** Mez. - Mechanical Room - CMU Mortar	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%			

Reporting Notes:

(1) Sample prepared for analysis by ELAP 198.6 method

Analyzed by: Valeriu Voicu
Date: 11/28/2023

Reviewed by: Karol H. Lu

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 229915, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

_____END OF REPORT_____

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: SUNY New Paltz - Peregrine	Date: 11/21/2023	Inspector: **David Seddon**
1 Hawk Dr	Client Project # 81056	
New Paltz NY 12561	Project #: KSQ 23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
1	1	R	Upper Roof - Top Layer - Rolled Roofing			
2	1		Middle Roof - ↓ - ↓			
3	2		Upper Roof - 2nd & 5th Layers - Dens Material Board			
4	2		Middle Roof - ↓ ↓ - ↓ Material Board			
5	3		Upper Roof - 3rd Layer - ISO Paper			
6	3		Middle Roof - ↓ - ↓			
7	4		Upper Roof - ~~Bottom~~ 4th Layer - Vapor Barrier Material			
8	4		Middle Roof - ↓ - ↓ ↓			
9	5		Upper Roof - Repair Material			
10	5		↓ - ↓			
11	6		Lower Roof - Tar on Exhaust Unit			
12	6		↓ - ↓ ↓			
13	7		↓ - Tar @ Wall on Bricks			
14	7	↓	Middle Roof - ↓ ↓			

Special Instructions/ Turnaround Time:

223113115 24h TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: 11/28/23 10:58
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: SUNY New Paltz Peregrine Dining Hall	Date: 11/21/23	Inspector: **David Seddon**
	Client Project # 87056	
	Project #: KSQ 23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
15	8	R	Middle Roof - Roof Drain Tar			
16	8	↓	- ↓			
17	9	↓	Upper Roof - @ Edge - Perlite Cant Board			
18	9	↓	Middle Roof - @ Wall - ↓ ↓			
19	10	↓	- Pitch Pocket Material			
20	10	↓	- ↓ ↓			
21	11	↓	- Caulk @ Louver - Newer			
22	11	↓	- ↓ - ↓			
23	12	↓	- ↓ - Older			
24	12	↓	- ↓ - ↓			
25	13	↓	Furnace Room Roof - Caulking @ Exh Pipe			
26	13	↓	- ↓ ↓			
27	14	↓	Middle Roof - Caulking @ ~~the~~ Exhaust Unit			
28	14	↓	- ↓ ↓			

Special Instructions/ Turnaround Time: 24h TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: 11/28/23 10:58
Relinquished by:
Received by:

223113115

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: SUNY New Paltz Peregrine Dining Hall	Date: 11/21/23	Inspector: **David Seddon**
	Client Project # 81056	
	Project #: KSQ 23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
29	15	Mez	Mechanical Room - HVAC Insulation on Duct			
30	15	↓	- ↓ ↓			
31	15	↓	- ↓ ↓			
32	16	↓	- Muddled Fitting for Roof Drain Pipe			
33	16	↓	- ↓ ↓ ↓			
34	16	↓	- ↓ ↓ ↓			
35	17	↓	- HVAC Duct - Cloth Wrap			
36	17	↓	- ↓ - ↓			
37	17	↓	- ↓ - ↓			
38	18	↓	- HVAC - Vibration Cloth			
39	18	↓	- ↓ - ↓			
40	19	R	Furnace Room Roof - Tar on Concrete Deck; Concrete			
41	19	↓	↓ ↓ - ↓ ↓ ↓			
42	20	MEZ	Mechanical Room - Wall Material			

Special Instructions/ Turnaround Time: 24h TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: 11/28/23 10:58
Relinquished by:
Received by:

223113115

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: SUNY New Paltz Peregrine Dining Hall	Date: 11/21/2023	Inspector: **David Seddon**
	Client Project # 81051	
	Project #: KSQ 23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
43	20	MEZ	Mechanical Room - Wall Material			
44	21	Ext	Exterior - Brick Mortar			
45	21	↓	↓ -			
46	22	MEZ	Mechanical Room - CMU			
47	22	↓	↓ - ↓			
48	23	↓	↓ - ↓ Mortar			
49	23	↓	↓ - ↓ ↓			
			223113115			

Special Instructions/ Turnaround Time:

24h
TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: 11/28/23 10:58
Relinquished by:
Received by:

Client Name: Adelaide Environmental Health

Table I
Summary of Bulk Asbestos Analysis Results

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1 Hawk Dr., SUNY New Paltz 12561 - Client Project #81056

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	50	24	0.444	56.6	8.7	34.6	NAD	NAD
Location:	Floor 1 - Switchgear Room - Main Feed Wire - Braided Type							
02	51	24	0.290	55.6	13.6	30.8	NAD	NAD
Location:	Floor 2 - Kitchen - Main Feed Wire - Braided Type							
03	52	25	0.094	91.0	4.0	5.0	NAD	NAD
Location:	Floor 2 - Kitchen - Light Wire - Vinyl							
04	53	25	0.109	92.4	2.9	4.8	NAD	NAD
Location:	Floor 1 - Mechanical Room - Light Wire - Vinyl							
05	54	26	0.131	72.5	24.4	3.1	NAD	NAD
Location:	Floor 1 - Switchgear Room - Electrical Wire - Vinyl @ Box							
06	55	26	0.085	96.4	-0.7	4.4	NAD	NAD
Location:	Floor 2 - Kitchen - Electrical Wire - Vinyl @ Light							
07	56	27	0.354	42.8	3.8	53.4	NAD	NAD
Location:	Floor 1 - Switchgear Room - @ Switchgear - ARC Board - Red							
08	57	27	0.306	43.6	5.7	50.7	NAD	NAD
Location:	Floor 1 - Switchgear Room - @ Switchgear - ARC Board - Red							
09	58	28	0.159	86.3	5.3	8.4	NAD	NAD
Location:	Floor 1 - Switchgear Room - @ Switchgear - ARC Paper - Gray							
10	59	28	0.123	86.0	3.0	11.0	NAD	NAD
Location:	Floor 1 - Switchgear Room - @ Switchgear - ARC Paper - Gray							
11	60	29	0.125	99.9	-0.4	0.5	NAD	NAD
Location:	Floor 1 - Switchgear Room - @ Switchgear - ARC Board - Black							
12	61	29	0.118	99.9	-0.2	0.3	NAD	NAD
Location:	Floor 1 - Switchgear Room - @ Switchgear - ARC Board - Black							
13	62	30	----	----	----	----	NAD	NA
Location:	Floor 2 - Kitchen - @ Electrical Panel - ARC Board - Brown							
14	63	30	----	----	----	----	NAD	NA
Location:	Floor 2 - Kitchen - @ Electrical Panel - ARC Board - Brown							
15	64	31	0.145	99.0	0.8	0.2	NAD	NAD
Location:	Floor 2 - Kitchen - @ Electrical Panel - Arch Board - Gray (Type 2)							
16	65	31	0.194	99.6	0.2	0.2	NAD	NAD
Location:	Floor 2 - Kitchen - @ Electrical Panel - Arch Board - Gray (Type 2)							

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1 Hawk Dr., SUNY New Paltz 12561 - Client Project #81056

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	66	32	0.164	68.3	2.4	9.8	Chrysotile 19.5	NA
Location:	Ext. - Exterior - Can Light - Tar Coated Light Wire							
18	67	32	0.237	58.1	0.6	41.2	NA/PS	NA
Location:	Ext. - Exterior - Can Light - Tar Coated Light Wire							
19	68	33	0.242	58.2	0.6	17.7	Chrysotile 23.5	NA
Location:	Mez. - Dining Area - Above Hard Ceiling - Old Light Wire							
20	69	33	0.123	66.5	2.3	31.2	NA/PS	NA
Location:	Mez. - Dining Area - Above Hard Ceiling - Old Light Wire							
21	70	34	0.285	54.3	6.4	39.4	NAD	NAD
Location:	Ext. - Exterior - AC-1 Disconnect Panel - Red Board							
22	71	34	0.388	53.7	5.1	41.2	NAD	NAD
Location:	Ext. - Exterior - AC-1 Disconnect Panel - Red Board							
23	72	35	0.170	87.4	9.7	2.9	NAD	NAD
Location:	Floor 1 - Campus Auxiliary Services - (102) - Carpet Adhesive (Green)							
24	73	35	0.182	86.2	9.2	4.6	NAD	NAD
Location:	Floor 1 - Campus Auxiliary Services - (102) - Carpet Adhesive (Green)							
25	74	36	0.237	65.6	29.7	4.7	NAD	NAD
Location:	Floor 1 - Campus Auxiliary Services - (102) - Covebase							
26	75	36	0.319	59.2	38.1	2.7	NAD	NAD
Location:	Floor 1 - Campus Auxiliary Services - (102) - Covebase							
27	76	37	0.375	36.9	41.6	21.5	NAD	NAD
Location:	Floor 1 - Campus Auxiliary Services - (102) - Adhesive							
28	77	37	0.328	47.1	36.7	16.1	NAD	NAD
Location:	Floor 1 - Campus Auxiliary Services - (102) - Adhesive							
29	78	38	0.331	7.6	66.1	26.4	NAD	NAD
Location:	Floor 1 - Campus Auxiliary Services - (102) - Ceiling Tile - Texture							
30	79	38	0.321	6.7	67.7	25.6	NAD	NAD
Location:	Floor 1 - Campus Auxiliary Services - (102) - Ceiling Tile - Texture							
31	80	39	0.213	88.3	5.1	6.5	NAD	NAD
Location:	Floor 1 - Generator Room - Main Power Wire - Vinyl							
32	81	39	0.208	89.3	3.9	6.8	NAD	NAD
Location:	Floor 1 - Generator Room - Main Power Wire - Vinyl							

See Reporting notes on last page

Client Name: Adelaide Environmental Health

Table I
Summary of Bulk Asbestos Analysis Results

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1 Hawk Dr., SUNY New Paltz 12561 - Client Project #81056

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
33	82	40	----	----	----	----	Chrysotile 12.1	NA
Location: Ext. - Exterior - Transite Soffit								
34	83	40	----	----	----	----	NA/PS	NA
Location: Ext. - Exterior - Transite Soffit								
35	84	41	0.273	38.5	53.3	8.2	NAD	NAD
Location: Ext. - Exterior - Caulk Between Fascia Stone								
36	85	41	0.248	36.8	54.6	8.6	NAD	NAD
Location: Ext. - Exterior - Caulk Between Fascia Stone								
37	86	42	0.267	31.9	59.0	9.1	NAD	NAD
Location: Ext. - Exterior - Caulk @ Window Sill - Gray								
38	87	42	0.252	32.9	57.4	9.7	NAD	NAD
Location: Ext. - Exterior - Caulk @ Window Sill - Gray								
39	88	43	0.256	45.7	39.4	14.9	NAD	NAD
Location: Ext. - Exterior - NW Elevation - Red Caulk @ Windows								
40	89	43	0.228	50.7	40.5	8.8	NAD	NAD
Location: Ext. - Exterior - NW Elevation - Red Caulk @ Windows								

Analyzed by: Khaalid W. Perine
Date: 11/29/2023

Reviewed by: Karol H. Lu

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H600-Noran 7 System, Microscope, Serial #: 600-27-6. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Adelaide Environmental Health
Attn: John Soter
1511 Rte. 22 Suite C24

Brewster, NY 10509

Date Received 11/28/23
Date Examined 11/28/23
ELAP # 11480

AmeriSci Job # 223113114
P.O. #
Page 1 **of** 8

RE: KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1 Hawk Dr., SUNY New Paltz 12561 - Client Project #81056

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
50 24	223113114-01 **Location:** Floor 1 - Switchgear Room - Main Feed Wire - Braided Type **Analyst Description:** Red/Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 34.6%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
51 24	223113114-02 **Location:** Floor 2 - Kitchen - Main Feed Wire - Braided Type **Analyst Description:** Tan/Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 30.8%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
52 25	223113114-03 **Location:** Floor 2 - Kitchen - Light Wire - Vinyl **Analyst Description:** Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 5%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
53 25	223113114-04 **Location:** Floor 1 - Mechanical Room - Light Wire - Vinyl **Analyst Description:** Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4.8%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
54 26	223113114-05 **Location:** Floor 1 - Switchgear Room - Electrical Wire - Vinyl @ Box **Analyst Description:** White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.1%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1
Hawk Dr., SUNY New Paltz 12561 - Client Project #81056

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
55 26	223113114-06 **Location:** Floor 2 - Kitchen - Electrical Wire - Vinyl @ Light	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4.4%			
56 27	223113114-07 **Location:** Floor 1 - Switchgear Room - @ Switchgear - ARC Board - Red	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Red, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 20%, Non-fibrous 33.4%			
57 27	223113114-08 **Location:** Floor 1 - Switchgear Room - @ Switchgear - ARC Board - Red	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Red, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 15%, Non-fibrous 35.7%			
58 28	223113114-09 **Location:** Floor 1 - Switchgear Room - @ Switchgear - ARC Paper - Gray	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 8.4%			
59 28	223113114-10 **Location:** Floor 1 - Switchgear Room - @ Switchgear - ARC Paper - Gray	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 11%			
60 29	223113114-11 **Location:** Floor 1 - Switchgear Room - @ Switchgear - ARC Board - Black	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.5%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1
Hawk Dr., SUNY New Paltz 12561 - Client Project #81056

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
61 29	223113114-12 **Location:** Floor 1 - Switchgear Room - @ Switchgear - ARC Board - Black	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.3%			
62 30	223113114-13 **Location:** Floor 2 - Kitchen - @ Electrical Panel - ARC Board - Brown	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23
Analyst Description: Brown, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 90%, Non-fibrous 10%			
63 30	223113114-14 **Location:** Floor 2 - Kitchen - @ Electrical Panel - ARC Board - Brown	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23
Analyst Description: Brown, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 85%, Non-fibrous 15%			
64 31	223113114-15 **Location:** Floor 2 - Kitchen - @ Electrical Panel - Arch Board - Gray (Type 2)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Gray/Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.2%			
65 31	223113114-16 **Location:** Floor 2 - Kitchen - @ Electrical Panel - Arch Board - Gray (Type 2)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Gray/Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.2%			
66 32	223113114-17 **Location:** Ext. - Exterior - Can Light - Tar Coated Light Wire	***Yes***	19.5% (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 19.5 % **Other Material:** Non-fibrous 9.8%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1
Hawk Dr., SUNY New Paltz 12561 - Client Project #81056

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
67 32	223113114-18 **Location:** Ext. - Exterior - Can Light - Tar Coated Light Wire **Analyst Description:** Bulk Material **Asbestos Types:** **Other Material:**		NA/PS
68 33	223113114-19 **Location:** Mez. - Dining Area - Above Hard Ceiling - Old Light Wire **Analyst Description:** Black, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 23.5 % **Other Material:** Non-fibrous 17.7%	***Yes***	23.5% (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
69 33	223113114-20 **Location:** Mez. - Dining Area - Above Hard Ceiling - Old Light Wire **Analyst Description:** Bulk Material **Asbestos Types:** **Other Material:**		NA/PS
70 34	223113114-21 **Location:** Ext. - Exterior - AC-1 Disconnect Panel - Red Board **Analyst Description:** Red, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 10%, Non-fibrous 29.4%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
71 34	223113114-22 **Location:** Ext. - Exterior - AC-1 Disconnect Panel - Red Board **Analyst Description:** Red, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 10%, Non-fibrous 31.2%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
72 35	223113114-23 **Location:** Floor 1 - Campus Auxiliary Services - (102) - Carpet Adhesive (Green) **Analyst Description:** Green, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.9%	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1
Hawk Dr., SUNY New Paltz 12561 - Client Project #81056

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
73 35	223113114-24 **Location:** Floor 1 - Campus Auxiliary Services - (102) - Carpet Adhesive (Green)	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Green, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4.6%			
74 36	223113114-25 **Location:** Floor 1 - Campus Auxiliary Services - (102) - Covebase	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4.7%			
75 36	223113114-26 **Location:** Floor 1 - Campus Auxiliary Services - (102) - Covebase	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.7%			
76 37	223113114-27 **Location:** Floor 1 - Campus Auxiliary Services - (102) - Adhesive	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 21.5%			
77 37	223113114-28 **Location:** Floor 1 - Campus Auxiliary Services - (102) - Adhesive	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 16.1%			
78 38	223113114-29 **Location:** Floor 1 - Campus Auxiliary Services - (102) - Ceiling Tile - Texture	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: White/Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 26.4%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1
Hawk Dr., SUNY New Paltz 12561 - Client Project #81056

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
79 38	223113114-30 **Location:** Floor 1 - Campus Auxiliary Services - (102) - Ceiling Tile - Texture	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: White/Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 25.6%			
80 39	223113114-31 **Location:** Floor 1 - Generator Room - Main Power Wire - Vinyl	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 6.5%			
81 39	223113114-32 **Location:** Floor 1 - Generator Room - Main Power Wire - Vinyl	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 6.8%			
82 40	223113114-33 **Location:** Ext. - Exterior - Transite Soffit	***Yes***	12.1% (by NYS ELAP 198.1) by Valeriu Voicu on 11/28/23
Analyst Description: Gray/Beige, Heterogeneous, Fibrous, Cementitious, Bulk Material **Asbestos Types:** Chrysotile 12.1 % **Other Material:** Non-fibrous 87.9%			
83 40	223113114-34 **Location:** Ext. - Exterior - Transite Soffit		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			
84 41	223113114-35 **Location:** Ext. - Exterior - Caulk Between Fascia Stone	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 8.2%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1
Hawk Dr., SUNY New Paltz 12561 - Client Project #81056

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
85 41	223113114-36 **Location:** Ext. - Exterior - Caulk Between Fascia Stone	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 8.6%			
86 42	223113114-37 **Location:** Ext. - Exterior - Caulk @ Window Sill - Gray	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 9.1%			
87 42	223113114-38 **Location:** Ext. - Exterior - Caulk @ Window Sill - Gray	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 9.7%			
88 43	223113114-39 **Location:** Ext. - Exterior - NW Elevation - Red Caulk @ Windows	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Maroon, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 14.9%			
89 43	223113114-40 **Location:** Ext. - Exterior - NW Elevation - Red Caulk @ Windows	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 11/28/23
Analyst Description: Maroon, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 8.8%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ 23261.00-IN; SUNY New Paltz; Peregrine Dining Hall - 1
Hawk Dr., SUNY New Paltz 12561 - Client Project #81056

Reporting Notes:

Analyzed by: Valeriu Voicu
Date: 11/28/2023

Reviewed by: Karol H. Lu

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 229915, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

_____END OF REPORT_____

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: SUNY New Paltz Peregrine Dining Hall - 1 Hawk Dr. SUNY New Paltz 12561	Date: 11/22/2023	Inspector: **David Seddon**
	Client Project # 81056	
	Project #: KSP 23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
50	24	1	Switchgear Room - Main Feed Wire - ~~Braided~~ Braided Type			
51	24	2	Kitchen - ↓ - ↓			
52	25	2	↓ - Light wire - Vinyl			
53	25	1	Mechanical Room - ↓ - ↓			
54	26	1	Switchgear Room - Electrical wire - Vinyl @ Box			
55	26	2	Kitchen - ↓ - ↓ @ Light			
56	27	1	Switchgear Room - @ switchgear - ARC Board - RED			
57	27	↓	↓ - ↓ - ↓ - ↓			
58	28	↓	↓ - @ Switch - ARC Paper - Gray			
59	28	↓	↓ - ↓ - ↓ - ↓			
60	29	↓	↓ - @ Switch - ARC Board - Black			
61	29	↓	↓ - ↓ - ↓ - ↓			
62	30	2	Kitchen - @ Electrical Panel - ARC Board - Brown			
63	30	2	↓ - ↓ - ↓ - ↓			

Special Instructions/ Turnaround Time: 24h TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: 11/28/23 10:59
Relinquished by:
Received by:

223113114

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: SUNY New Paltz Peregrine Dining Hall - 1 Hawk Dr	Date: 11/22/2023	Inspector: **David Seddon**
	Client Project # 81056	
	Project #: KSQ 23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
64	31	2	Kitchen - @ Electrical Panel - Arch Board - Gray (Type 2)			
65	31	2	↓ - ↓ - ↓ - ↓ ↓			
66	32	Ext	Exterior - Can Light - Tar Coated Light Wire			
67	32	↓	↓ - ↓ - ↓ ↓			
68	33	Mez	Dining Area - Above Hard Ceiling - Old Light Wire			
69	33	↓	↓ - ↓ - ↓			
70	34	Ext	Exterior - AC-1 Disconect Panel - Red Board			
71	34	↓	↓ - ↓ ↓ - ↓			
72	35	1	Campus Auxiliary Services - (102) - Carpet Adhesive (Green)			
73	35	↓	↓ - ↓ - ↓			
74	36		- - Coveabase			
75	36		- - ↓			
76	37		- - Adhesive			
77	37	↓	↓ - ↓ - ↓			

Special Instructions/ Turnaround Time:

2 Wk
TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: 11/28/23 10:59
Relinquished by:
Received by:

223113114

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: SUNY New Paltz Peregrine Dining Hall	Date: 11/22/2023	Inspector: **David Seddon**
	Client Project # 81056	
	Project #: KSP 23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
78	38	1	Campus Auxiliary Services - (102) - Ceiling Tile - Texture			
79	38	↓	↓ - ↓ ↓ - ↓			
80	39	↓	~~Switch Gear~~ Generator Room - Main Power Wire - Vinyl			
81	39	↓	Generator Room - ↓ - ↓			
82	40	Ext	Exterior - Trasite Soffit			
83	40	↓	↓ - ↓			
84	41	↓	↓ - Caulk Between Facia Stone			
85	41	↓	↓ - ↓ ↓			
86	42	↓	↓ - Caulk @ Window Sill - Gray			
87	42	↓	↓ - ↓ ↓ - ↓			
88	43	↓	↓ NW Elevation - Red Caulk @ Windows			
89	43	↓	↓ SW ↓ - ↓ ↓			

Special Instructions/ Turnaround Time: 24h TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: 11/28/23 10:59
Relinquished by:
Received by:

223113114

Client Name: Adelaide Environmental Health

Table I
Summary of Bulk Asbestos Analysis Results

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	90	44	----	----	----	----	NAD	NA
Location: 1st Fl., Men's Bathroom - Ceramic Wall Tile (1st Layer) Grout								
02	91	44	----	----	----	----	NAD	NA
Location: 1st Fl., Men's Bathroom - Ceramic Wall Tile (1st Layer) Grout								
03	92	45	0.225	14.5	82.4	3.1	NAD	NAD
Location: 1st Fl., Men's Bathroom - Ceramic Wall Tile (1st Layer) Adhesive								
04	93	45	0.218	14.4	80.5	5.1	NAD	NAD
Location: 1st Fl., Men's Bathroom - Ceramic Wall Tile (1st Layer) Adhesive								
05	94	46	----	----	----	----	NAD	NA
Location: 1st Fl., Men's Bathroom - Ceramic Wall Tile Durarock Board								
06	95	46	----	----	----	----	NAD	NA
Location: 1st Fl., Men's Bathroom - Ceramic Wall Tile Durarock Board								
07	96	47	----	----	----	----	NAD	NA
Location: 1st Fl., Men's Bathroom - Ceramic Wall Tile (2nd Layer) Grout								
08	97	47	----	----	----	----	NAD	NA
Location: 1st Fl., Men's Bathroom - Ceramic Wall Tile (2nd Layer) Grout								
09	98	48	----	----	----	----	NAD	NA
Location: 1st Fl., Men's Bathroom - Ceramic Wall Tile (2nd Layer) Mudset								
10	99	48	----	----	----	----	NAD	NA
Location: 1st Fl., Men's Bathroom - Ceramic Wall Tile (2nd Layer) Mudset								
11	100	49	----	----	----	----	NAD	NA
Location: 1st Fl., Men's Bathroom - Ceramic Floor Tile Grout								
12	101	49	----	----	----	----	NAD	NA
Location: 1st Fl., Men's Bathroom - Ceramic Floor Tile Grout								
13	102	50	----	----	----	----	NAD	NA
Location: 1st Fl., Men's Bathroom - Ceramic Floor Tile Mudset								
14	103	50	----	----	----	----	NAD	NA
Location: 1st Fl., Men's Bathroom - Ceramic Floor Tile Mudset								
15	104	51	0.285	30.6	67.1	2.3	NAD	NAD
Location: 1st Fl., Men's Bathroom - Caulk @ Fixtures								
16	105	51	0.207	31.1	66.5	2.4	NAD	NAD
Location: 1st Fl., Men's Bathroom - Caulk @ Fixtures								

See Reporting notes on last page

Client Name: Adelaide Environmental Health

Table I
Summary of Bulk Asbestos Analysis Results

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	106	52	0.217	14.6	83.9	1.4	NAD	NAD
Location: 1st Fl., Storage B - 12 x 12 Cream W/ Black & Brown								
18	107	52	0.261	13.6	84.8	1.6	NAD	NAD
Location: 1st Fl., Storage B - 12 x 12 Cream W/ Black & Brown								
19	108	53	0.162	14.0	42.8	43.1	NAD	NAD
Location: 1st Fl., Storage B - Mastic W/ Leveler								
20	109	53	0.305	17.9	34.8	47.3	NAD	NAD
Location: 1st Fl., Storage B - Mastic W/ Leveler								
21	110	54	0.205	55.4	42.3	2.3	NAD	NAD
Location: 1st Fl., Storage B - Cove Base								
22	111	54	0.312	56.0	41.5	2.5	NAD	NAD
Location: 1st Fl., Storage B - Cove Base								
23	112	55	0.210	66.7	8.8	24.5	NAD	NAD
Location: 1st Fl., Storage B - Cove Base Adhesive								
24	113	55	0.177	35.0	49.1	15.9	NAD	NAD
Location: 1st Fl., Storage B - Cove Base Adhesive								
25	114	56	0.234	75.2	11.4	13.4	NAD	NAD
Location: 1st Fl., Storage B - Sheet Flooring								
26	115	56	0.250	77.0	10.8	12.2	NAD	NAD
Location: 1st Fl., Storage B - Sheet Flooring								
27	116	57	0.125	47.0	29.4	23.6	NAD	NAD
Location: 1st Fl., Storage B - FRP Panel Adhesive								
28	117	57	0.179	46.6	26.5	26.9	NAD	NAD
Location: 1st Fl., Storage B - FRP Panel Adhesive								
29	118	58	----	----	----	----	NAD	NA
Location: 2nd Fl., Dining Area - Sheetrock								
30	119	58	----	----	----	----	NAD	NA
Location: 1st Fl., Room 151 - Sheetrock								
31	120	59	----	----	----	----	NAD	NA
Location: 2nd Fl., Dining Area - Joint Compound								
32	121	59	----	----	----	----	NAD	NA
Location: 1st Fl., Room 151 - Joint Compound								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
33	122	60	0.248	18.4	36.8	44.8	NAD	NAD
Location: 1st Fl., Men's Bathroom - Ceiling Tile (Mountains W/ Holes)								
34	123	60	0.116	18.3	37.2	44.5	NAD	NAD
Location: 1st Fl., Men's Bathroom - Ceiling Tile (Mountains W/ Holes)								
35L1	124	61	0.347	21.6	51.6	26.7	NAD	NAD
Location: 1st Fl., Bathroom Hallway - Adhesive For Vinyl Floor								
35L2	124	61	----	----	----	----	NAD	NA
Location: 1st Fl., Bathroom Hallway - Leveler For Vinyl Floor								
36L1	125	61	0.302	20.9	53.5	25.6	NAD	NAD
Location: 1st Fl., Bathroom Hallway - Adhesive For Vinyl Floor								
36L2	125	61	----	----	----	----	NAD	NA
Location: 1st Fl., Bathroom Hallway - Leveler For Vinyl Floor								
37	126	62	0.175	13.0	56.0	31.0	NAD	NAD
Location: 1st Fl., Computer Area - Ceiling Tile								
38	127	62	0.242	14.0	48.1	37.9	NAD	NAD
Location: 1st Fl., Computer Area - Ceiling Tile								
39	128	63	0.225	28.7	50.7	20.6	NAD	NAD
Location: 1st Fl., Computer Area - Carpet Adhesive W/ Cover								
40	129	63	0.269	34.9	46.8	18.3	NAD	NAD
Location: 1st Fl., Computer Area - Carpet Adhesive W/ Cover								
41	130	64	0.249	27.8	46.6	25.6	NAD	NAD
Location: 2nd Fl., All Gender Bathroom - Ceiling Tile (Sheetrock Type)								
42	131	64	0.282	14.6	48.0	37.4	NAD	NAD
Location: 2nd Fl., All Gender Bathroom - Ceiling Tile (Sheetrock Type)								
43	132	65	----	----	----	----	NAD	NA
Location: 1st Fl., Room 133 - Fiberglass Pipe Wrap (Cloth Type)								
44	133	65	----	----	----	----	NAD	NA
Location: 1st Fl., Room 133 - Fiberglass Pipe Wrap (Cloth Type)								
45	134	65	----	----	----	----	NAD	NA
Location: 1st Fl., Room 133 - Fiberglass Pipe Wrap (Cloth Type)								
46	135	66	0.251	42.2	37.2	16.7	Chrysotile 3.9	NA
Location: 2nd Fl., Office - Window Glazing Sealant								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
47	136	66	0.231	42.2	36.1	21.7	NA/PS	NA
Location: 2nd Fl., Office - Window Glazing Sealant								
48	137	67	----	----	----	----	NAD	NA
Location: 1st Fl., Stairwell Closet - Stone Flooring Grout								
49	138	67	----	----	----	----	NAD	NA
Location: 1st Fl., Stairwell Closet - Stone Flooring Grout								
50	139	68	----	----	----	----	NAD	NA
Location: 1st Fl., Stairwell Closet - Stone Flooring Mudset / Fill								
51	140	68	----	----	----	----	NAD	NA
Location: 1st Fl., Stairwell Closet - Stone Flooring Mudset / Fill								
52	141	69	----	----	----	----	NAD	NA
Location: 2nd Fl., Rear Entry - Quarry Tile Grout								
53	142	69	----	----	----	----	NAD	NA
Location: 2nd Fl., Rear Entry - Quarry Tile Grout								
54	143	70	----	----	----	----	NAD	NA
Location: 2nd Fl., Rear Entry - Quarry Tile Mudset								
55	144	70	----	----	----	----	NAD	NA
Location: 2nd Fl., Rear Entry - Quarry Tile Mudset								
56	145	71	0.173	53.9	40.0	6.1	NAD	NAD
Location: 1st Fl., Room 133 - HVAC Duct Sealant (Gray)								
57	146	71	0.179	54.0	43.1	2.9	NAD	NAD
Location: 1st Fl., Room 133 - HVAC Duct Sealant (Gray)								
58	147	72	0.118	29.4	41.3	29.3	NAD	NAD
Location: 2nd Fl., Office - Ceiling Tile (Squiggles W/ Holes)								
59	148	72	0.090	29.3	48.3	22.4	NAD	NAD
Location: 2nd Fl., Office - Ceiling Tile (Squiggles W/ Holes)								
60	149	73	0.369	-0.1	96.9	3.2	NAD	NAD
Location: 2nd Fl., Dining Area - 12 x 12 Floor Tile (Red)								
61	150	73	0.387	14.6	82.1	3.3	NAD	NAD
Location: 2nd Fl., Dining Area - 12 x 12 Floor Tile (Red)								
62	151	74	0.263	14.0	84.5	1.5	NAD	NAD
Location: 2nd Fl., Dining Area - 12 x 12 Floor Tile (Yellow)								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
63	152	74	0.248	12.2	86.3	1.5	NAD	NAD
Location: 2nd Fl., Dining Area - 12 x 12 Floor Tile (Yellow)								
64	153	75	0.286	13.9	84.1	1.9	NAD	Chrysotile Trace
Location: 2nd Fl., Dining Area - 12 x 12 Floor Tile (Blue)								
65	154	75	0.310	14.3	83.7	2.0	NAD	Chrysotile Trace
Location: 2nd Fl., Dining Area - 12 x 12 Floor Tile (Blue)								
66	155	76	0.251	15.0	82.8	2.2	NAD	NAD
Location: 2nd Fl., Dining Area - 12 x 12 Floor Tile (Black W/ White)								
67	156	76	0.264	15.6	80.8	3.6	NAD	NAD
Location: 2nd Fl., Dining Area - 12 x 12 Floor Tile (Black W/ White)								
68	157	77	0.218	78.4	8.8	12.8	NAD	NAD
Location: 2nd Fl., Dining Area - Black Mastic (Bottom Layer)								
69	158	77	0.302	60.6	22.4	17.1	NAD	NAD
Location: 2nd Fl., Office - Black Mastic (1st Layer)								
70	159	78	0.297	15.6	79.8	4.6	NAD	NAD
Location: 2nd Fl., Dining Area - 2-Layer Tile (Beige)								
71	160	78	0.258	14.7	80.5	4.8	NAD	NAD
Location: 2nd Fl., Dining Area - 2-Layer Tile (Beige)								
72	161	79	0.242	15.8	78.9	5.3	NAD	NAD
Location: 2nd Fl., Dining Area - 2-Layer Tile (Pink W/ Beige)								
73	162	79	0.214	14.7	81.8	3.5	NAD	NAD
Location: 2nd Fl., Dining Area - 2-Layer Tile (Pink W/ Beige)								
74	163	80	0.298	47.1	42.8	10.1	NAD	NAD
Location: 2nd Fl., Dining Area - Mastic For 1st Layer Floor Tile								
75	164	80	0.239	26.5	64.1	9.4	NAD	NAD
Location: 2nd Fl., Dining Area - Mastic For 1st Layer Floor Tile								
76	165	81	----	----	----	----	NAD	NA
Location: 2nd Fl., Dining Area - Red Concrete Material								
77	166	81	----	----	----	----	NAD	NA
Location: 2nd Fl., Dining Area - Red Concrete Material								
78	167	82	0.263	25.8	22.5	44.1	Chrysotile 7.7	NA
Location: 2nd Fl., Stairwell - 9 x 9 Floor Tile								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
79	168	82	0.246	26.6	30.3	43.1	NA/PS	NA
Location: 2nd Fl., Stairwell - 9 x 9 Floor Tile								
80	169	83	0.093	37.8	32.1	26.8	Chrysotile 3.3	NA
Location: 2nd Fl., Stairwell - Mastic								
81	170	83	0.083	56.5	21.4	22.2	NA/PS	NA
Location: 2nd Fl., Stairwell - Mastic								
82	171	84	----	----	----	----	NAD	NA
Location: 2nd Fl., Rear Entrance - Concrete								
83	172	84	----	----	----	----	NAD	NA
Location: 2nd Fl., Rear Entrance - Concrete								
84	173	85	0.185	18.0	32.1	49.9	NAD	NAD
Location: 2nd Fl., Serving Area - Textured Floor Cover (Dark Gray)								
85	174	85	0.261	18.2	41.8	40.0	NAD	NAD
Location: 2nd Fl., Serving Area - Textured Floor Cover (Dark Gray)								
86	175	86	0.271	36.0	5.6	58.4	NAD	NAD
Location: 2nd Fl., Serving Area - Textured Floor Cover (Light Gray)								
87	176	86	0.151	23.4	30.3	46.3	NAD	NAD
Location: 2nd Fl., Serving Area - Textured Floor Cover (Light Gray)								
88L1	177	87	0.202	13.7	85.3	1.0	NAD	NAD
Location: 2nd Fl., Office - 12 x 12 Floor Tile (Beige W/ Beige & Cream)								
88L2	177	87	0.150	22.0	72.0	6.1	NAD	NAD
Location: 2nd Fl., Office - 12 x 12 Floor Tile (Beige W/ Beige & Cream)								
89L1	178	87	0.273	13.6	84.3	2.1	NAD	NAD
Location: 2nd Fl., Office - 12 x 12 Floor Tile (Beige W/ Beige & Cream)								
89L2	178	87	0.093	70.7	10.0	19.3	NAD	NAD
Location: 2nd Fl., Office - 12 x 12 Floor Tile (Beige W/ Beige & Cream)								
90	179	88	----	----	----	----	NAD	NA
Location: 1st Fl., Room 132 - Wall Cover Material								
91	180	88	----	----	----	----	NAD	NA
Location: 2nd Fl., Dining Area - Wall Cover Material								
92	181	89	----	----	----	----	NAD	NA
Location: 2nd Fl., Dining Area (N) - Ceiling Soft Textured (Top Layer)								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
93	182	89	----	----	----	----	NAD	NA
Location: 2nd Fl., Dining Area (C) - Ceiling Soft Textured (Top Layer)								
94	183	89	----	----	----	----	NAD	NA
Location: 2nd Fl., Dining Area (S) - Ceiling Soft Textured (Top Layer)								
95	184	89	----	----	----	----	NAD	NA
Location: 2nd Fl., Dining Area (S) - Ceiling Soft Textured (Top Layer)								
96	185	89	----	----	----	----	NAD	NA
Location: 1st Fl., Room 153 - Ceiling Soft Textured (Top Layer)								
97	186	89	----	----	----	----	NAD	NA
Location: 1st Fl., Storage B - Ceiling Soft Textured (Top Layer)								
98	187	89	----	----	----	----	NAD	NA
Location: 1st Fl., Lobby - Ceiling Soft Textured (Top Layer)								
99	188	90	----	----	----	----	NAD	NA
Location: 2nd Fl., Dining Area (N) - Ceiling (Base Coat)								
100	189	90	----	----	----	----	NAD	NA
Location: 2nd Fl., Dining Area (C) - Ceiling (Base Coat)								
101	190	90	----	----	----	----	NAD	NA
Location: 2nd Fl., Dining Area (S) - Ceiling (Base Coat)								
102	191	90	----	----	----	----	NAD	NA
Location: 2nd Fl., Dining Area (S) - Ceiling (Base Coat)								
103	192	90	----	----	----	----	NAD	NA
Location: 1st Fl., Room 153 - Ceiling (Base Coat)								
104	193	90	----	----	----	----	NAD	NA
Location: 1st Fl., Storage B - Ceiling (Base Coat)								
105	194	90	----	----	----	----	NAD	NA
Location: 1st Fl., Lobby - Ceiling (Base Coat)								
106	195	91	----	----	----	----	NAD	NA
Location: 1st Fl., Hallway - Wall Plaster (Top Coat)								
107	196	91	----	----	----	----	NAD	NA
Location: 1st Fl., Hallway - Wall Plaster (Top Coat)								
108	197	91	----	----	----	----	NAD	NA
Location: 1st Fl., Computer Rm. - Wall Plaster (Top Coat)								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
109	198	91	----	----	----	----	NAD	NA
Location: 1st Fl., Room 132 - Wall Plaster (Top Coat)								
110	199	91	----	----	----	----	NAD	NA
Location: 1st Fl., Room 132 - Wall Plaster (Top Coat)								
111	200	91	----	----	----	----	NAD	NA
Location: 2nd Fl., Dining Area (S) - Wall Plaster (Top Coat)								
112	201	91	----	----	----	----	NAD	NA
Location: 2nd Fl., Dining Area (N) - Wall Plaster (Top Coat)								
113	202	92	----	----	----	----	NAD	NA
Location: 1st Fl., Hallway - Wall Plaster (Base Coat)								
114	203	92	----	----	----	----	NAD	NA
Location: 1st Fl., Hallway - Wall Plaster (Base Coat)								
115	204	92	----	----	----	----	NAD	NA
Location: 1st Fl., Computer Rm. - Wall Plaster (Base Coat)								
116	205	92	----	----	----	----	NAD	NA
Location: 1st Fl., Room 132 - Wall Plaster (Base Coat)								
117	206	92	----	----	----	----	NAD	NA
Location: 1st Fl., Room 132 - Wall Plaster (Base Coat)								
118	207	92	----	----	----	----	NAD	NA
Location: 2nd Fl., Dining Area (S) - Wall Plaster (Base Coat)								
119	208	92	----	----	----	----	NAD	NA
Location: 2nd Fl., Dining Area (N) - Wall Plaster (Base Coat)								
120	209	93	----	----	----	----	NAD	NA
Location: 2nd Fl., Office - Debris On Ceiling Tile								
121	210	94	----	----	----	----	NAD	NA
Location: 1st Fl., Lobby - Debris On Ceiling Tile								
122	211	95	----	----	----	----	NAD	NA
Location: 1st Fl., Room 153 - Debris On Ceiling Tile								
123	212	96	----	----	----	----	NAD	NA
Location: 1st Fl., Room 157 - Debris On Ceiling Tile								
124	213	97	----	----	----	----	NAD	NA
Location: 1st Fl., Men's BR Hallway - Debris On Ceiling Tile								

See Reporting notes on last page

Client Name: Adelaide Environmental Health

Table I
Summary of Bulk Asbestos Analysis Results

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
125	214	98	----	----	----	----	NAD	NA
Location: 1st Fl., Men's Bathroom - Material On Beam								
126	215	98	----	----	----	----	NAD	NA
Location: 1st Fl., Men's Bathroom - Material On Beam								
127L1	216	99	0.193	54.5	43.4	2.1	NAD	NAD
Location: 1st Fl., Room 133 - Cove Base								
127L2	216	99	0.155	46.4	42.0	11.6	NAD	NAD
Location: 1st Fl., Room 133 - Cove Base W/ Adhesive								
128L1	217	99	0.314	56.4	41.2	2.4	NAD	NAD
Location: 1st Fl., Room 133 - Cove Base								
128L2	217	99	0.273	44.2	43.2	12.6	NAD	NAD
Location: 1st Fl., Room 133 - Cove Base W/ Adhesive								

Analyzed by: Feyza Gungor

Date: 12/1/2023

Reviewed by: Feyza Gungor

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H7000-Noran 7 System, Microscope, Serial #: 747-05-06. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Adelaide Environmental Health
Attn: John Soter
1511 Rte. 22 Suite C24

Brewster, NY 10509

Date Received 11/30/23
Date Examined 11/30/23
ELAP # 11480

AmeriSci Job # 223113311
P.O. #
Page 1 **of** 23

RE: KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
90 44	223113311-01 **Location:** 1st Fl., Men's Bathroom - Ceramic Wall Tile (1st Layer) Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
91 44	223113311-02 **Location:** 1st Fl., Men's Bathroom - Ceramic Wall Tile (1st Layer) Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
92 45	223113311-03 **Location:** 1st Fl., Men's Bathroom - Ceramic Wall Tile (1st Layer) Adhesive	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Cream, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.1%			
93 45	223113311-04 **Location:** 1st Fl., Men's Bathroom - Ceramic Wall Tile (1st Layer) Adhesive	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Cream, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 5.1%			
94 46	223113311-05 **Location:** 1st Fl., Men's Bathroom - Ceramic Wall Tile Durarock Board	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr.,
New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
95 46	223113311-06 **Location:** 1st Fl., Men's Bathroom - Ceramic Wall Tile Durarock Board	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
96 47	223113311-07 **Location:** 1st Fl., Men's Bathroom - Ceramic Wall Tile (2nd Layer) Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
97 47	223113311-08 **Location:** 1st Fl., Men's Bathroom - Ceramic Wall Tile (2nd Layer) Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
98 48	223113311-09 **Location:** 1st Fl., Men's Bathroom - Ceramic Wall Tile (2nd Layer) Mudset	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
99 48	223113311-10 **Location:** 1st Fl., Men's Bathroom - Ceramic Wall Tile (2nd Layer) Mudset	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
100 49	223113311-11 **Location:** 1st Fl., Men's Bathroom - Ceramic Floor Tile Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
101 49	223113311-12 **Location:** 1st Fl., Men's Bathroom - Ceramic Floor Tile Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
102 50	223113311-13 **Location:** 1st Fl., Men's Bathroom - Ceramic Floor Tile Mudset	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
103 50	223113311-14 **Location:** 1st Fl., Men's Bathroom - Ceramic Floor Tile Mudset	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
104 51	223113311-15 **Location:** 1st Fl., Men's Bathroom - Caulk @ Fixtures	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.3%			
105 51	223113311-16 **Location:** 1st Fl., Men's Bathroom - Caulk @ Fixtures	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.4%			
106 52	223113311-17 **Location:** 1st Fl., Storage B - 12 x 12 Cream W/ Black & Brown	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Cream, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1.4%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
107 52	223113311-18 **Location:** 1st Fl., Storage B - 12 x 12 Cream W/ Black & Brown	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Cream, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1.6%			
108 53	223113311-19 **Location:** 1st Fl., Storage B - Mastic W/ Leveler	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Yellow/Brown, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 43.1%			
109 53	223113311-20 **Location:** 1st Fl., Storage B - Mastic W/ Leveler	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Yellow/Brown, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 47.3%			
110 54	223113311-21 **Location:** 1st Fl., Storage B - Cove Base	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.3%			
111 54	223113311-22 **Location:** 1st Fl., Storage B - Cove Base	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.5%			
112 55	223113311-23 **Location:** 1st Fl., Storage B - Cove Base Adhesive	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 24.5%			

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PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
113 55	223113311-24 **Location:** 1st Fl., Storage B - Cove Base Adhesive	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 15.9%			
114 56	223113311-25 **Location:** 1st Fl., Storage B - Sheet Flooring	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 13.4%			
115 56	223113311-26 **Location:** 1st Fl., Storage B - Sheet Flooring	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 12.2%			
116 57	223113311-27 **Location:** 1st Fl., Storage B - FRP Panel Adhesive	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 23.6%			
117 57	223113311-28 **Location:** 1st Fl., Storage B - FRP Panel Adhesive	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 26.9%			
118 58	223113311-29 **Location:** 2nd Fl., Dining Area - Sheetrock	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose Trace, Non-fibrous 100%			

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PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
119 58	223113311-30 **Location:** 1st Fl., Room 151 - Sheetrock	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White/Brown, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 20%, Non-fibrous 80%			
120 59	223113311-31 **Location:** 2nd Fl., Dining Area - Joint Compound	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
121 59	223113311-32 **Location:** 1st Fl., Room 151 - Joint Compound	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
122 60	223113311-33 **Location:** 1st Fl., Men's Bathroom - Ceiling Tile (Mountains W/ Holes)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 44.8%			
123 60	223113311-34 **Location:** 1st Fl., Men's Bathroom - Ceiling Tile (Mountains W/ Holes)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 44.5%			
124 61	223113311-35L1 **Location:** 1st Fl., Bathroom Hallway - Adhesive For Vinyl Floor	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 26.7%			

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PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
124 61	223113311-35L2 **Location:** 1st Fl., Bathroom Hallway - Leveler For Vinyl Floor	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
125 61	223113311-36L1 **Location:** 1st Fl., Bathroom Hallway - Adhesive For Vinyl Floor	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 25.6%			
125 61	223113311-36L2 **Location:** 1st Fl., Bathroom Hallway - Leveler For Vinyl Floor	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
126 62	223113311-37 **Location:** 1st Fl., Computer Area - Ceiling Tile	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 31%			
127 62	223113311-38 **Location:** 1st Fl., Computer Area - Ceiling Tile	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 37.9%			
128 63	223113311-39 **Location:** 1st Fl., Computer Area - Carpet Adhesive W/ Cover	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 20.6%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
129 63	223113311-40 **Location:** 1st Fl., Computer Area - Carpet Adhesive W/ Cover	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 18.3%			
130 64	223113311-41 **Location:** 2nd Fl., All Gender Bathroom - Ceiling Tile (Sheetrock Type)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 25.6%			
131 64	223113311-42 **Location:** 2nd Fl., All Gender Bathroom - Ceiling Tile (Sheetrock Type)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 37.4%			
132 65	223113311-43 **Location:** 1st Fl., Room 133 - Fiberglass Pipe Wrap (Cloth Type)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Yellow, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 25%, Fibrous glass 75%			
133 65	223113311-44 **Location:** 1st Fl., Room 133 - Fiberglass Pipe Wrap (Cloth Type)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Yellow, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 25%, Fibrous glass 65%, Non-fibrous 10%			
134 65	223113311-45 **Location:** 1st Fl., Room 133 - Fiberglass Pipe Wrap (Cloth Type)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Yellow, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 25%, Fibrous glass 65%, Non-fibrous 10%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr.,
New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
135 66	223113311-46 **Location:** 2nd Fl., Office - Window Glazing Sealant	***Yes***	3.9% (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile 3.9 % **Other Material:** Non-fibrous 16.7%			
136 66	223113311-47 **Location:** 2nd Fl., Office - Window Glazing Sealant		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			
137 67	223113311-48 **Location:** 1st Fl., Stairwell Closet - Stone Flooring Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
138 67	223113311-49 **Location:** 1st Fl., Stairwell Closet - Stone Flooring Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
139 68	223113311-50 **Location:** 1st Fl., Stairwell Closet - Stone Flooring Mudset / Fill	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
140 68	223113311-51 **Location:** 1st Fl., Stairwell Closet - Stone Flooring Mudset / Fill	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
141 69	223113311-52 **Location:** 2nd Fl., Rear Entry - Quarry Tile Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
142 69	223113311-53 **Location:** 2nd Fl., Rear Entry - Quarry Tile Grout	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
143 70	223113311-54 **Location:** 2nd Fl., Rear Entry - Quarry Tile Mudset	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
144 70	223113311-55 **Location:** 2nd Fl., Rear Entry - Quarry Tile Mudset	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
145 71	223113311-56 **Location:** 1st Fl., Room 133 - HVAC Duct Sealant (Gray)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 6.1%			
146 71	223113311-57 **Location:** 1st Fl., Room 133 - HVAC Duct Sealant (Gray)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.9%			

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PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
147 72	223113311-58 **Location:** 2nd Fl., Office - Ceiling Tile (Squiggles W/ Holes)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 29.3%			
148 72	223113311-59 **Location:** 2nd Fl., Office - Ceiling Tile (Squiggles W/ Holes)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 22.4%			
149 73	223113311-60 **Location:** 2nd Fl., Dining Area - 12 x 12 Floor Tile (Red)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.2%			
150 73	223113311-61 **Location:** 2nd Fl., Dining Area - 12 x 12 Floor Tile (Red)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.3%			
151 74	223113311-62 **Location:** 2nd Fl., Dining Area - 12 x 12 Floor Tile (Yellow)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1.5%			
152 74	223113311-63 **Location:** 2nd Fl., Dining Area - 12 x 12 Floor Tile (Yellow)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1.5%			

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PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
153 75	223113311-64 **Location:** 2nd Fl., Dining Area - 12 x 12 Floor Tile (Blue)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2%			
154 75	223113311-65 **Location:** 2nd Fl., Dining Area - 12 x 12 Floor Tile (Blue)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.1%			
155 76	223113311-66 **Location:** 2nd Fl., Dining Area - 12 x 12 Floor Tile (Black W/ White)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.2%			
156 76	223113311-67 **Location:** 2nd Fl., Dining Area - 12 x 12 Floor Tile (Black W/ White)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.6%			
157 77	223113311-68 **Location:** 2nd Fl., Dining Area - Black Mastic (Bottom Layer)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 12.8%			
158 77	223113311-69 **Location:** 2nd Fl., Office - Black Mastic (1st Layer)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 17.1%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
159 78	223113311-70 **Location:** 2nd Fl., Dining Area - 2-Layer Tile (Beige)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4.6%			
160 78	223113311-71 **Location:** 2nd Fl., Dining Area - 2-Layer Tile (Beige)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4.8%			
161 79	223113311-72 **Location:** 2nd Fl., Dining Area - 2-Layer Tile (Pink W/ Beige)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Pink, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 5.3%			
162 79	223113311-73 **Location:** 2nd Fl., Dining Area - 2-Layer Tile (Pink W/ Beige)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Pink, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.5%			
163 80	223113311-74 **Location:** 2nd Fl., Dining Area - Mastic For 1st Layer Floor Tile	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 10.1%			
164 80	223113311-75 **Location:** 2nd Fl., Dining Area - Mastic For 1st Layer Floor Tile	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 9.4%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
165 81	223113311-76 **Location:** 2nd Fl., Dining Area - Red Concrete Material	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
166 81	223113311-77 **Location:** 2nd Fl., Dining Area - Red Concrete Material	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
167 82	223113311-78 **Location:** 2nd Fl., Stairwell - 9 x 9 Floor Tile	***Yes***	7.7% (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile 7.7 % **Other Material:** Non-fibrous 44.1%			
168 82	223113311-79 **Location:** 2nd Fl., Stairwell - 9 x 9 Floor Tile		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			
169 83	223113311-80 **Location:** 2nd Fl., Stairwell - Mastic	***Yes***	3.3% (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile 3.3 % **Other Material:** Non-fibrous 26.8%			
170 83	223113311-81 **Location:** 2nd Fl., Stairwell - Mastic		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
171 84	223113311-82 **Location:** 2nd Fl., Rear Entrance - Concrete	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
172 84	223113311-83 **Location:** 2nd Fl., Rear Entrance - Concrete	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
173 85	223113311-84 **Location:** 2nd Fl., Serving Area - Textured Floor Cover (Dark Gray)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 49.9%			
174 85	223113311-85 **Location:** 2nd Fl., Serving Area - Textured Floor Cover (Dark Gray)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 40%			
175 86	223113311-86 **Location:** 2nd Fl., Serving Area - Textured Floor Cover (Light Gray)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 58.4%			
176 86	223113311-87 **Location:** 2nd Fl., Serving Area - Textured Floor Cover (Light Gray)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 46.3%			

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PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
177 87	223113311-88L1 **Location:** 2nd Fl., Office - 12 x 12 Floor Tile (Beige W/ Beige & Cream)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1%			
177 87	223113311-88L2 **Location:** 2nd Fl., Office - 12 x 12 Floor Tile (Beige W/ Beige & Cream)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 6.1%			
178 87	223113311-89L1 **Location:** 2nd Fl., Office - 12 x 12 Floor Tile (Beige W/ Beige & Cream)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.1%			
178 87	223113311-89L2 **Location:** 2nd Fl., Office - 12 x 12 Floor Tile (Beige W/ Beige & Cream)	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 19.3%			
179 88	223113311-90 **Location:** 1st Fl., Room 132 - Wall Cover Material	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White/Beige, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 20%, Non-fibrous 80%			
180 88	223113311-91 **Location:** 2nd Fl., Dining Area - Wall Cover Material	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White/Beige, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 20%, Non-fibrous 80%			

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PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
181 89	223113311-92 **Location:** 2nd Fl., Dining Area (N) - Ceiling Soft Textured (Top Layer)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 10%, Non-fibrous 90%			
182 89	223113311-93 **Location:** 2nd Fl., Dining Area (C) - Ceiling Soft Textured (Top Layer)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 10%, Non-fibrous 90%			
183 89	223113311-94 **Location:** 2nd Fl., Dining Area (S) - Ceiling Soft Textured (Top Layer)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 10%, Non-fibrous 90%			
184 89	223113311-95 **Location:** 2nd Fl., Dining Area (S) - Ceiling Soft Textured (Top Layer)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 10%, Non-fibrous 90%			
185 89	223113311-96 **Location:** 1st Fl., Room 153 - Ceiling Soft Textured (Top Layer)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 15%, Non-fibrous 85%			
186 89	223113311-97 **Location:** 1st Fl., Storage B - Ceiling Soft Textured (Top Layer)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 15%, Non-fibrous 85%			

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PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
187 89	223113311-98 **Location:** 1st Fl., Lobby - Ceiling Soft Textured (Top Layer)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 15%, Non-fibrous 85%			
188 90	223113311-99 **Location:** 2nd Fl., Dining Area (N) - Ceiling (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
189 90	223113311-100 **Location:** 2nd Fl., Dining Area (C) - Ceiling (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
190 90	223113311-101 **Location:** 2nd Fl., Dining Area (S) - Ceiling (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
191 90	223113311-102 **Location:** 2nd Fl., Dining Area (S) - Ceiling (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
192 90	223113311-103 **Location:** 1st Fl., Room 153 - Ceiling (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			

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PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
193 90	223113311-104 **Location:** 1st Fl., Storage B - Ceiling (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
194 90	223113311-105 **Location:** 1st Fl., Lobby - Ceiling (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
195 91	223113311-106 **Location:** 1st Fl., Hallway - Wall Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
196 91	223113311-107 **Location:** 1st Fl., Hallway - Wall Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
197 91	223113311-108 **Location:** 1st Fl., Computer Rm. - Wall Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
198 91	223113311-109 **Location:** 1st Fl., Room 132 - Wall Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			

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PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
199 91	223113311-110 **Location:** 1st Fl., Room 132 - Wall Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
200 91	223113311-111 **Location:** 2nd Fl., Dining Area (S) - Wall Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
201 91	223113311-112 **Location:** 2nd Fl., Dining Area (N) - Wall Plaster (Top Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
202 92	223113311-113 **Location:** 1st Fl., Hallway - Wall Plaster (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
203 92	223113311-114 **Location:** 1st Fl., Hallway - Wall Plaster (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
204 92	223113311-115 **Location:** 1st Fl., Computer Rm. - Wall Plaster (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			

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PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
205 92	223113311-116 **Location:** 1st Fl., Room 132 - Wall Plaster (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
206 92	223113311-117 **Location:** 1st Fl., Room 132 - Wall Plaster (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
207 92	223113311-118 **Location:** 2nd Fl., Dining Area (S) - Wall Plaster (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
208 92	223113311-119 **Location:** 2nd Fl., Dining Area (N) - Wall Plaster (Base Coat)	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
209 93	223113311-120 **Location:** 2nd Fl., Office - Debris On Ceiling Tile	***No***	NAD [1] (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 20%, Non-fibrous 80%			
210 94	223113311-121 **Location:** 1st Fl., Lobby - Debris On Ceiling Tile	***No***	NAD [1] (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 20%, Non-fibrous 80%			

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PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr., New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
211 95	223113311-122 **Location:** 1st Fl., Room 153 - Debris On Ceiling Tile	***No***	NAD [1] (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 20%, Non-fibrous 80%			
212 96	223113311-123 **Location:** 1st Fl., Room 157 - Debris On Ceiling Tile	***No***	NAD [1] (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 20%, Non-fibrous 80%			
213 97	223113311-124 **Location:** 1st Fl., Men's BR Hallway - Debris On Ceiling Tile	***No***	NAD [1] (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: White, Heterogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Fibrous glass 20%, Non-fibrous 80%			
214 98	223113311-125 **Location:** 1st Fl., Men's Bathroom - Material On Beam	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
215 98	223113311-126 **Location:** 1st Fl., Men's Bathroom - Material On Beam	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 11/30/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
216 99	223113311-127L1 **Location:** 1st Fl., Room 133 - Cove Base	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Dark Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.1%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz - Dining Hall; 1 Hawk Dr.,
New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
216 99	223113311-127L2 **Location:** 1st Fl., Room 133 - Cove Base W/ Adhesive	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Cream, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 11.6%			
217 99	223113311-128L1 **Location:** 1st Fl., Room 133 - Cove Base	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Dark Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.4%			
217 99	223113311-128L2 **Location:** 1st Fl., Room 133 - Cove Base W/ Adhesive	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 11/30/23
Analyst Description: Cream, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 12.6%			

Reporting Notes:

(1) Analysis Results For Soil, Dust, Or Debris May Be Highly Variable Because Of The Heterogeneous Nature Of These Samples

Analyzed by: Kensen Caro
Date: 11/30/2023

Reviewed by: Feyza Gungor

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 229003, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

_____END OF REPORT_____

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

223113311

Site Address: SUNY New Paltz - Dwyer Hall, 1 Hawk Dr, New Paltz NY 12561	Date: 11/24/2023	Inspector: **David Seddon**
	Client Project #	
	Project #: KSQ 23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
90	44	1st	Mens Bathroom - Ceramic Wall Tile - 1st Layer - Grout			
91	44		- - -			
92	45		- - - Adhesive			
93	45		- - -			
94	46		- - Dura Rock Board			
95	46		- -			
96	47		- - 2nd Layer - Grout			
97	47		- - -			
98	48		- - - Mudset			
99	48		- - -			
100	49		- Ceramic Floor Tile - Grout			
101	49		- -			
102	50		- - Mudset			
103	50		- -			

Special Instructions/ Turnaround Time:

24h
TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: Claudia Martinez 11/30/23 1140
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

223113311

Site Address: SUNY New Paltz	Date: 11/24/23	Inspector: **David Seddon**
	Client Project #	
	Project #: KSG 23261.00-TW	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
104	51	1st	Mens Bathroom - Caulk @ Fixtures			
105	51	↑	↓ - ↓			
106	52		Storage B - 12x12 Cream w/ Black & Brown			
107	52		- ↓ ↓			
108	53		- Mastic w/ Coublar			
109	53		- ↓ ↓			
110	54		- Covebase			
111	54		-			
112	55		- Adhesive			
113	55		- ↓ ↓			
114	56		- Sheet flooring			
115	56		- ↓			
116	57		- FRP Panel Adhesive			
117	57	↓	- ↓ ↓			

Special Instructions/ Turnaround Time: 24h

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

TAT

Relinquished by: DS
Received by: Claudio Martinez 11/30/23 1140
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

223113311

Site Address: SUNY New Paltz	Date: 11/24/23	Inspector: **David Seddon**
	Client Project #	
	Project #: 23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
118	58	2	Dining Area - Sheet rock			
119	58	1	Room 151 - ↓			
120	59	2	Dining Area - Joint Compound			
121	59	1	Room 151 - ↓			
122	60	1	Mens Bathroom - Ceiling Tile - Mount, and 4 Holes			
123	60	1	↓ - ↓ - ↓			
124	61	1	Bathroom Hallway - Adhesive & Covering for Vinyl Floor			
125	61	1	↓ - ↓ ↓ ↓			
126	62	1	Computer Area - Ceiling Tile -			
127	62	1	- ↓			
128	63	1	- Carpet Adhesive & Cover			
129	63	1	- ↓ ↓			
130	64	2	All Gender Bathroom - Ceiling Tile - Sheetrock Type			
131	64	2	↓ - ↓ - ↓			

Special Instructions/ Turnaround Time: 24h TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: Claudia Mooting 11/30/23 1140
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

223113311

Site Address: SUNY New Paltz	Date: 11/24/23	Inspector: **David Seddon**
	Client Project #	
	Project #: 23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
132	65	1	Room 133 - Fiberglass Pipe Wrap - cloth type			
133	65	1	↓ - ↓ - ↓			
134	65	1	↓ - ↓ - ↓			
135	66	2	Office - Window Glazing Sealant			
136	66	2	↓ - ↓ ↓			
137	67	1	Stairwell Closet - Stone Flooring - Grout			
138	67	1	↓ - ↓ - ↓			
139	68	1	↓ - ↓ - Mudset/Fill			
140	68	1	↓ - ↓ - ↓			
141	69	2	Rear Entry - Quarry Tile - Grout			
142	69	2	↓ - ↓ - ↓			
143	70	2	↓ - ↓ - Mudset			
144	70	2	↓ - ↓ - ↓			
145	71	1	Room 133 - HVAC Duct Sealant - Gray			

Special Instructions/ Turnaround Time:

24h
TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: Claudia Martinez 11/30/23 1140
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

223113311

Site Address: SUNY New Paltz	Date: 11/24/23	Inspector: **David Seddon**
	Client Project #	
	Project #: 23261.00-TW	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
146	71	1	Room 133 - HVAC Duct Sealant - Gray			
147	72	2	Office - Ceiling Tile - Squiggles w/ Holes			
148	72	2	↓ - ↓ - ↓			
149	73	2	Dining Area - 12x12 Floor Tile - Red			
150	73		- - ↓			
151	74		- - Yellow			
152	74		- - ↓			
153	75		- - Blue			
154	75		- - ↓			
155	76		- - Black w/ White			
156	76		- ↓			
157	77		Dining Area - Black Mastic - Bottom Layer			
158	77		Office - ↓ - 1st Layer			
159	78		Dining Area - 2 Layer Tile - Beige			

Special Instructions/ Turnaround Time:

2 wk
TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: Claudia Martinez 11/30/23 1140
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

223113311

Site Address: SUNY New Paltz	Date: 11/24/23	Inspector: **David Seddon**
	Client Project #	
	Project #: 23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
160	78	2	Dining Area - 2 Layer Tile - Beige			
161	79		- - Pink w/ Beige			
162	79		- -			
163	80		- Mastic for 1st Layer Floor Tile			
164	80		-			
165	81		- Red Concrete Material			
166	81		-			
167	82		Stairwell - 9x9 Floor Tile			
168	82		-			
169	83		- Mastic			
170	83		-			
171	84		Rear Entrance - Concrete			
172	84		-			
173	85		Serving Area - Textured Floor Coat - Dark Gray			

Special Instructions/ Turnaround Time:

24h
TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: Claudia Martinez 11/30/23 1140
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

223113311

Site Address: SUNY New Paltz	Date: 11/24/23	Inspector: **David Seddon**
	Client Project #	
	Project #: 23261.00-TN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
174	85	2	Serving Area - Textured Floor Cover - Dark Gray			
175	86		- - - Light			
176	86		- - -			
177	87		Office - 12x12 Floor Tile - Beige w Beige & Green			
178	87		- - -			
179	88	1	Room 132 - Wall Cover Material			
180	88	2	Dining Area -			
181	89	2	Dining Area (N) - Ceiling - Soft Textured Top Layer			
182	89		(C) - -			
183	89		(S) - -			
184	89		(S) - -			
185	89	1	Room 153 - -			
186	89	1	Storage B - -			
187	89	1	Lobby - -			

Special Instructions/ Turnaround Time: 24h TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: Claudia Martinez 11/30/23 1:40
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: SUNY New Paltz	Date: 11/24/23	Inspector: David Seddon 2231133311
	Client Project #	
	Project #: 23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
188	90	2	Dining Area (N) - Ceiling - Base Coat			
189	90	↓	(C) - -			
190	90	↓	(S) - -			
191	90	↓	(S) - -			
192	90	1	Room 153 - -			
193	90	1	Storage B - -			
194	90	1	Lobby - -			
195	91	1	Hallway - Wall - Plaster Top Coat			
196	91	1	↓ - -			
197	91	1	Computer Rm - -			
198	91	1	Room 132 - -			
199	91	1	↓ - -			
200	91	2	Dining Area (S) - -			
201	91	2	↓ (N) - -			

Special Instructions/ Turnaround Time: 24h TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: Claudia Martinez 11/30/23 1:40
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

223113311

Site Address: SUNY New Paltz	Date: 11/24/23	Inspector: **David Seddon**
	Client Project #	
	Project #: 23261.00-TN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
202	92	1	Hallway - Wall - Plaster Base Coat			
203	92	1	↓ - ↓ - ↓			
204	92	1	Computer Rm - -			
205	92	1	Room 132 - -			
206	92	1	↓ - -			
207	92	2	Dining Area (S) - -			
208	92	2	↓ (N) - ↓ - ↓			
209	93	2	Office - Debris on Ceiling Tile			
210	94	1	Lobby - ↓			
211	95	1	Room 153 - ↓			
212	96	1	↓ 157 - ↓			
213	97	1	Mens BR Hallway - ↓			
214	98	1	Mens Bathroom - Material on Beam			
215	98	1	↓ - ↓			

Special Instructions/ Turnaround Time:

24h.
TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: Claudia Martinez 11/30/23 1140
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

223113311

Site Address: SUNY New Paltz	Date: 11/29/23	Inspector: **David Seddon**
	Client Project #	
	Project #: 23261.00-TJ	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
216	99	1	Room 133 - Cove base, w/ Adhesive			
217	99	1	" - "			

Special Instructions/ Turnaround Time:

24h
TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: Claudia Martinez 11/30/23 1140
Relinquished by:
Received by:

AmeriSci Job #: **223122911**

Client Name: Adelaide Environmental Health

Table I
Summary of Bulk Asbestos Analysis Results

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	218	100	0.271	76.6	16.2	7.2	NAD	NAD
Location: 2nd Floor Level, Cooler Entry Wall - Wall Paper								
02	219	100	0.227	78.0	9.7	12.3	NAD	NAD
Location: 2nd Floor Level, Office - Wall Paper								
03	220	101	0.130	47.0	7.7	45.3	NAD	NAD
Location: 2nd Floor Level, Office - Wall Panel - Adhesive On Wall Paper								
04	221	101	0.161	48.5	3.7	47.8	NAD	NAD
Location: 2nd Floor Level, Office - Wall Panel - Adhesive On Wall Paper								
05L1	222	102	0.253	24.4	58.4	14.6	Chrysotile 2.6	NA
Location: 2nd Floor Level, Office - Flooring Layer - Floor Tile, Mastic, Leveler / Tile								
05L2	222	102	0.244	31.6	50.9	15.6	Chrysotile 1.8	NA
Location: 2nd Floor Level, Office - Flooring Layer - Floor Tile, Mastic, Leveler / Mastic								
05L3	222	102	----	----	----	----	NAD	NA
Location: 2nd Floor Level, Office - Flooring Layer - Floor Tile, Mastic, Leveler / Leveler								
06L1	223	102	0.194	23.7	57.1	19.2	NA/PS	NA
Location: 2nd Floor Level, Office - Flooring Layer - Floor Tile, Mastic, Leveler / Tile								
06L2	223	102	0.051	77.2	19.8	2.9	NA/PS	NA
Location: 2nd Floor Level, Office - Flooring Layer - Floor Tile, Mastic, Leveler / Mastic								
06L3	223	102	----	----	----	----	NAD	NA
Location: 2nd Floor Level, Office - Flooring Layer - Floor Tile, Mastic, Leveler / Leveler								
07	224	103	0.191	22.2	69.6	8.0	Chrysotile <0.25	Chrysotile <1.0
Location: 2nd Floor Level, Office - Interior Window - Window Glazing Compound								
08	225	103	0.139	28.2	62.2	9.4	Chrysotile <0.25	Chrysotile <1.0
Location: 2nd Floor Level, Office - Interior Window - Window Glazing Compound								
09	226	104	----	----	----	----	NAD	NA
Location: 2nd Floor Level, Locker Room - Terrazzo Floor Basin								
10	227	104	----	----	----	----	NAD	NA
Location: 2nd Floor Level, Locker Room - Terrazzo Floor Basin								
11	228	105	0.286	34.9	44.9	20.2	NAD	NAD
Location: 2nd Floor Level, Locker Room - Caulk On Floor Basin								
12	229	105	0.246	32.4	45.0	22.7	NAD	NAD
Location: 2nd Floor Level, Locker Room - Caulk On Floor Basin								

See Reporting notes on last page

Client Name: Adelaide Environmental Health

Table I
Summary of Bulk Asbestos Analysis Results

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
13	230	106	0.139	39.1	52.6	8.3	NAD	NAD
Location: 2nd Floor Level, Storage Room - Door Caulk								
14	231	106	0.233	43.3	45.4	11.3	NAD	NAD
Location: 2nd Floor Level, Cooler Entry Wall - Caulk @ Wall Trim								
15	232	107	0.126	69.8	17.4	12.7	Chrysotile <0.25	Chrysotile <1.0
Location: 2nd Floor Level, Serving Area - Wrap Tape On Condense Pipe								
16	233	107	0.112	92.2	6.9	0.8	NAD	Chrysotile Trace
Location: 2nd Floor Level, Back Corner Cooler - Wrap Tape On Condense Pipe								
17	234	108	0.201	61.4	16.4	22.2	NAD	NAD
Location: 2nd Floor Level, Serving Area - Vapor Barrier Under Quarry Tile								
18	235	108	0.092	95.7	2.5	1.8	NAD	NAD
Location: 2nd Floor Level, Locker Room - Vapor Barrier Under Quarry Tile								

Analyzed by: Hongyan Ran
Date: 12/29/2023

Reviewed by: Hongyan Ran

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H7000-Noran 7 System, Microscope, Serial #: 747-05-06. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Adelaide Environmental Health
Attn: John Soter
1511 Rte. 22 Suite C24

Brewster, NY 10509

Date Received 12/28/23
Date Examined 12/29/23
ELAP # 11480

AmeriSci Job # 223122911
P.O. #
Page 1 **of** 5

RE: KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
218 100	223122911-01 **Location:** 2nd Floor Level, Cooler Entry Wall - Wall Paper	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/29/23
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 7.2%			
219 100	223122911-02 **Location:** 2nd Floor Level, Office - Wall Paper	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/29/23
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 12.3%			
220 101	223122911-03 **Location:** 2nd Floor Level, Office - Wall Panel - Adhesive On Wall Paper	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/29/23
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 45.3%			
221 101	223122911-04 **Location:** 2nd Floor Level, Office - Wall Panel - Adhesive On Wall Paper	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/29/23
Analyst Description: Tan, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 47.8%			
222 102	223122911-05L1 **Location:** 2nd Floor Level, Office - Flooring Layer - Floor Tile, Mastic, Leveler / Tile	***Yes***	2.6% (by NYS ELAP 198.6) by Valeriu Voicu on 12/29/23
Analyst Description: Gray/Beige, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 2.6 % **Other Material:** Non-fibrous 14.6%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
222 102	223122911-05L2 **Location:** 2nd Floor Level, Office - Flooring Layer - Floor Tile, Mastic, Leveler / Mastic	***Yes***	1.8% (by NYS ELAP 198.6) by Valeriu Voicu on 12/29/23
Analyst Description:	Black, Heterogeneous, Fibrous, Bulk Material		
Asbestos Types:	Chrysotile 1.8 %		
Other Material:	Non-fibrous 15.6%		
222 102	223122911-05L3 **Location:** 2nd Floor Level, Office - Flooring Layer - Floor Tile, Mastic, Leveler / Leveler	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 12/29/23
Analyst Description:	White/Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material		
Asbestos Types:			
Other Material:	Cellulose Trace, Non-fibrous 100%		
223 102	223122911-06L1 **Location:** 2nd Floor Level, Office - Flooring Layer - Floor Tile, Mastic, Leveler / Tile		NA/PS
Analyst Description:	Bulk Material		
Asbestos Types:			
Other Material:			
223 102	223122911-06L2 **Location:** 2nd Floor Level, Office - Flooring Layer - Floor Tile, Mastic, Leveler / Mastic		NA/PS
Analyst Description:	Bulk Material		
Asbestos Types:			
Other Material:			
223 102	223122911-06L3 **Location:** 2nd Floor Level, Office - Flooring Layer - Floor Tile, Mastic, Leveler / Leveler	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 12/29/23
Analyst Description:	White/Gray, Heterogeneous, Non-Fibrous, Cementitious, Bulk Material		
Asbestos Types:			
Other Material:	Cellulose Trace, Non-fibrous 100%		
224 103	223122911-07 **Location:** 2nd Floor Level, Office - Interior Window - Window Glazing Compound	***Yes***	Trace (<0.25 % pc)[1] (ELAP 400 PC) by Valeriu Voicu on 12/29/23
Analyst Description:	White/Beige, Heterogeneous, Non-Fibrous, Bulk Material		
Asbestos Types:	Chrysotile <0.25 % pc		
Other Material:	Non-fibrous 8.2%		

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
225 103	223122911-08 **Location:** 2nd Floor Level, Office - Interior Window - Window Glazing Compound	***Yes***	Trace (<0.25 % pc)[1] (ELAP 400 PC) by Valeriu Voicu on 12/29/23
Analyst Description: White/Beige, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile <0.25 % pc **Other Material:** Non-fibrous 9.6%			
226 104	223122911-09 **Location:** 2nd Floor Level, Locker Room - Terrazzo Floor Basin	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 12/29/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
227 104	223122911-10 **Location:** 2nd Floor Level, Locker Room - Terrazzo Floor Basin	***No***	NAD (by NYS ELAP 198.1) by Valeriu Voicu on 12/29/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
228 105	223122911-11 **Location:** 2nd Floor Level, Locker Room - Caulk On Floor Basin	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/29/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 20.2%			
229 105	223122911-12 **Location:** 2nd Floor Level, Locker Room - Caulk On Floor Basin	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/29/23
Analyst Description: Gray, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 22.7%			
230 106	223122911-13 **Location:** 2nd Floor Level, Storage Room - Door Caulk	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/29/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 8.3%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
231 106	223122911-14 **Location:** 2nd Floor Level, Cooler Entry Wall - Caulk @ Wall Trim	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/29/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 11.3%			
232 107	223122911-15 **Location:** 2nd Floor Level, Serving Area - Wrap Tape On Condense Pipe	***Yes***	Trace (<0.25 % pc)[1] (ELAP 400 PC) by Valeriu Voicu on 12/29/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile <0.25 % pc **Other Material:** Non-fibrous 12.9%			
233 107	223122911-16 **Location:** 2nd Floor Level, Back Corner Cooler - Wrap Tape On Condense Pipe	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/29/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.9%			
234 108	223122911-17 **Location:** 2nd Floor Level, Serving Area - Vapor Barrier Under Quarry Tile	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/29/23
Analyst Description: Black/Gray, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 22.2%			
235 108	223122911-18 **Location:** 2nd Floor Level, Locker Room - Vapor Barrier Under Quarry Tile	***No***	NAD (by NYS ELAP 198.6) by Valeriu Voicu on 12/29/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1.8%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Reporting Notes:

(1) Sample prepared for analysis by ELAP 198.6 method

Analyzed by: Valeriu Voicu
Date: 12/29/2023

Reviewed by: Hongyan Ran

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 229915, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

_____END OF REPORT_____

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

223122911

Site Address: SUNY New Paltz, Dining Hall	Date: 12/26/23	Inspector: David Seddon
1 Hawk Drive	Client Project #	
New Paltz, NY 12561	Project #: KSQ:23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
218	100	2	Cooler Entry Wall - Wallpaper			
219	100	2	Office -			
220	101		- Wallpanel Adhesive on Wallpaper			
221	101		-			
222	102		- Flooring Layers - Floor Tile, Mastic, Leveler			
223	102		- - -			
224	103		- Interior Window - Window Glazing Compound			
225	103		-			
226	104		Locker Room - Terrazzo Floor Basin			
227	104		-			
228	105		- Caulk @ Floor Basin			
229	105		-			
230	106		Storage Room - Door Caulk			
231	106		Cooler Entry Wall - Caulk @ Wall Trim			

Special Instructions/ Turnaround Time: 24h TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: 12/28/23 1025
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

223122911

Site Address: SUNY New Paltz, Dining Hall	Date: 12/26/23	Inspector: David Seddon
1 Hawk Drive	Client Project #	
New Paltz, NY 12561	Project #: KSQ:23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
232	107	2	Serving Area - Wrap Tape on Condenser Pipe			
233	107	↓	Back Corner Cooler - ↓ ↓ ↓			
234	108	↓	Serving Area - Vapor Barrier under Quarry Tile			
235	108	↓	Locker Room - ↓ ↓ ↓			

Special Instructions/ Turnaround Time:

24h
TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: 12/28/23 1025
Relinquished by:
Received by:

Table I
Summary of Bulk Asbestos Analysis Results
KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	236	109	0.287	39.6	4.7	55.7	NAD	NAD
Location: 1st Floor, Stairwell - Brown Stair Tread								
02	237	109	0.331	39.7	2.7	57.6	NAD	NAD
Location: 1st Floor, Stairwell - Brown Stair Tread								
03	238	110	0.223	64.8	21.3	13.9	NAD	NAD
Location: 1st Floor, Stairwell - Stair Tread Adhesive								
04	239	110	0.295	63.7	21.8	14.5	NAD	NAD
Location: 1st Floor, Stairwell - Stair Tread Adhesive								
05	240	111	0.136	91.4	5.6	3.0	NAD	NAD
Location: 2nd Floor, Marketing Managers Office - Carpet Tile Adhesive								
06	241	111	0.086	96.1	2.7	1.2	NAD	NAD
Location: 2nd Floor, Marketing Managers Office - Carpet Tile Adhesive								
07	242	112	0.194	52.6	44.6	2.8	NAD	NAD
Location: 2nd Floor, Marketing Managers Office - 6" Cove Base								
08	243	112	0.180	52.9	43.2	3.9	NAD	NAD
Location: 2nd Floor, Marketing Managers Office - 6" Cove Base								
09	244	113	0.154	48.5	40.7	10.8	NAD	NAD
Location: 2nd Floor, Marketing Managers Office - 6" Cove Base Adhesive								
10	245	113	0.235	42.2	57.1	0.7	NAD	NAD
Location: 2nd Floor, Marketing Managers Office - 6" Cove Base Adhesive								
11	246	114	0.059	25.5	36.1	38.5	NAD	NAD
Location: 2nd Floor, Dinning Area - Sink Coating								
12	247	114	0.109	25.2	37.4	37.4	NAD	NAD
Location: 2nd Floor, Dinning Area - Sink Coating								
13	248	115	0.262	61.6	28.4	10.0	NAD	NAD
Location: 2nd Floor, All Gender Bathroom - Red HVAC Duct Sealant								
14	249	115	0.140	61.4	29.2	9.3	NAD	NAD
Location: 2nd Floor, All Gender Bathroom - Red HVAC Duct Sealant								
15	250	116	----	----	----	----	NAD	NA
Location: 1st Floor, MER - HVAC Unit - Top Cover - Cloth								
16	251	116	----	----	----	----	NAD	NA
Location: 1st Floor, MER - HVAC Unit - Top Cover - Cloth								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	252	117	----	----	----	----	NAD	NA
Location: 1st Floor, MER - HVAC Unit - Top Cover - Cloth								
18	253	117	0.084	45.8	36.8	17.3	NAD	NAD
Location: 1st Floor, MER - HVAC Unit - 2nd Cover - Silver								
19	254	118	0.086	58.0	38.0	4.0	NAD	NAD
Location: 1st Floor, MER - HVAC Unit - 2nd Cover - Silver								
20	255	118	0.145	50.9	26.6	22.6	NAD	NAD
Location: 1st Floor, MER - HVAC Unit - 2nd Cover - Silver								
21	256	119	0.174	50.8	7.7	32.8	Chrysotile 8.7	NA
Location: 1st Floor, MER - HVAC Unit - Pin Mastic								
22	257	119	0.150	50.5	8.6	40.9	NA/PS	NA
Location: 1st Floor, MER - HVAC Unit - Pin Mastic								
23	258	120	0.120	65.7	27.3	6.9	NAD	NAD
Location: 1st Floor, MER - HVAC Unit - Vibration Cloth - Vinyl								
24	259	120	0.130	64.4	5.2	30.4	NAD	NAD
Location: 1st Floor, MER - HVAC Unit - Vibration Cloth - Vinyl								
25	260	121	0.279	27.8	12.3	60.0	NAD	NAD
Location: 1st Floor, MER - At Wall - Green Flange Gasket								
26	261	121	0.242	28.8	6.3	64.9	NAD	NAD
Location: 1st Floor, MER - At Wall - Green Flange Gasket								
27	262	122	0.244	31.5	4.1	64.4	NAD	NAD
Location: 1st Floor, MER - At Pumps - Cream								
28	263	122	0.215	41.3	5.5	53.2	NAD	NAD
Location: 1st Floor, MER - At Pumps - Cream								
29	264	123	0.207	27.8	65.9	6.3	NAD	NAD
Location: 1st Floor, MER - At Steam Gen. - Red Flange Gasket								
30	265	123	0.194	27.4	65.8	6.8	NAD	NAD
Location: 1st Floor, MER - At Steam Gen. - Red Flange Gasket								
31	266	124	----	----	----	----	Chrysotile 23.5	NA
Location: 1st Floor, MER - At HVAC - Mudded Fitting @ FG Pipe								
32	267	124	----	----	----	----	NA/PS	NA
Location: 1st Floor, MER - At Wall - Mudded Fitting @ FG Pipe								

See Reporting notes on last page

Table I
Summary of Bulk Asbestos Analysis Results
KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
33	268	124	----	----	----	----	NA/PS	NA
Location: 1st Floor, MER - At Ceiling - Mudded Fitting @ FG Pipe								
34	269	125	0.148	66.6	20.1	13.2	NAD	NAD
Location: 1st Floor, MER - At Wall - FG With Tar Insulation Wrap								
35	270	125	0.191	64.2	18.5	17.3	NAD	NAD
Location: 1st Floor, MER - At Wall - FG With Tar Insulation Wrap								
36	271	125	0.184	38.0	39.1	22.8	NAD	NAD
Location: 1st Floor, MER - At Wall - FG With Tar Insulation Wrap								
37	272	126	----	----	----	----	Chrysotile 20.0	NA
Location: 1st Floor, MER - At Water Tank - Exterior - Insulation							Amosite 6.7	
38	273	126	----	----	----	----	NA/PS	NA
Location: 1st Floor, MER - At Water Tank - Exterior - Insulation								
39	274	126	----	----	----	----	NA/PS	NA
Location: 1st Floor, MER - At Water Tank - Exterior - Insulation								
40	275	127	----	----	----	----	NAD	NA
Location: 1st Floor, MER - At Water Tank - Interior Material								
41	276	127	----	----	----	----	NAD	NA
Location: 1st Floor, MER - At Water Tank - Interior Material								
42	277	128	----	----	----	----	NAD	NA
Location: 1st Floor, MER - At Ceiling - Ceiling Block Material								
43	278	128	----	----	----	----	NAD	NA
Location: 1st Floor, MER - At Ceiling - Ceiling Block Material								
44	279	129	0.282	44.8	18.4	29.8	Chrysotile 7.0	NA
Location: 1st Floor, MER - At Ceiling - Glue Daubs On Concrete								
45	280	129	0.199	46.9	24.3	28.8	NA/PS	NA
Location: 1st Floor, MER - At Ceiling - Glue Daubs On Concrete								
46	281	130	0.249	30.7	65.2	4.1	NAD	NAD
Location: 1st Floor, Walk In Cooler Rm. - Red Firestop								
47	282	130	0.227	30.4	65.8	3.8	NAD	NAD
Location: 1st Floor, Walk In Cooler Rm. - Red Firestop								

See Reporting notes on last page

Client Name: Adelaide Environmental Health

Table I
Summary of Bulk Asbestos Analysis Results

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM

Analyzed by: Hongyan Ran
Date: 12/29/2023

Reviewed by: Hongyan Ran

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H7000-Noran 7 System, Microscope, Serial #: 747-05-06. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Adelaide Environmental Health
Attn: John Soter
1511 Rte. 22 Suite C24

Brewster, NY 10509

Date Received 12/28/23
Date Examined 12/29/23
ELAP # 11480

AmeriSci Job # 223122912
P.O. #
Page 1 **of** 9

RE: KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
236 109	223122912-01 **Location:** 1st Floor, Stairwell - Brown Stair Tread	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 55.7%			
237 109	223122912-02 **Location:** 1st Floor, Stairwell - Brown Stair Tread	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 57.6%			
238 110	223122912-03 **Location:** 1st Floor, Stairwell - Stair Tread Adhesive	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 13.9%			
239 110	223122912-04 **Location:** 1st Floor, Stairwell - Stair Tread Adhesive	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 14.5%			
240 111	223122912-05 **Location:** 2nd Floor, Marketing Managers Office - Carpet Tile Adhesive	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
241 111	223122912-06 **Location:** 2nd Floor, Marketing Managers Office - Carpet Tile Adhesive	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Yellow, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1.2%			
242 112	223122912-07 **Location:** 2nd Floor, Marketing Managers Office - 6" Cove Base	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.8%			
243 112	223122912-08 **Location:** 2nd Floor, Marketing Managers Office - 6" Cove Base	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Blue, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.9%			
244 113	223122912-09 **Location:** 2nd Floor, Marketing Managers Office - 6" Cove Base Adhesive	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 10.8%			
245 113	223122912-10 **Location:** 2nd Floor, Marketing Managers Office - 6" Cove Base Adhesive	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Beige, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.7%			
246 114	223122912-11 **Location:** 2nd Floor, Dinning Area - Sink Coating	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 38.5%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
247 114	223122912-12 **Location:** 2nd Floor, Dinning Area - Sink Coating	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 37.4%			
248 115	223122912-13 **Location:** 2nd Floor, All Gender Bathroom - Red HVAC Duct Sealant	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 10%			
249 115	223122912-14 **Location:** 2nd Floor, All Gender Bathroom - Red HVAC Duct Sealant	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 9.3%			
250 116	223122912-15 **Location:** 1st Floor, MER - HVAC Unit - Top Cover - Cloth	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 12/29/23
Analyst Description: Beige, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 90%, Non-fibrous 10%			
251 116	223122912-16 **Location:** 1st Floor, MER - HVAC Unit - Top Cover - Cloth	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 12/29/23
Analyst Description: Beige, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 90%, Non-fibrous 10%			
252 117	223122912-17 **Location:** 1st Floor, MER - HVAC Unit - Top Cover - Cloth	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 12/29/23
Analyst Description: Beige, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 90%, Non-fibrous 10%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
253 117	223122912-18 **Location:** 1st Floor, MER - HVAC Unit - 2nd Cover - Silver	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Silver/Brown, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 17.3%			
254 118	223122912-19 **Location:** 1st Floor, MER - HVAC Unit - 2nd Cover - Silver	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Silver/Brown, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4%			
255 118	223122912-20 **Location:** 1st Floor, MER - HVAC Unit - 2nd Cover - Silver	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Silver/Brown, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 22.6%			
256 119	223122912-21 **Location:** 1st Floor, MER - HVAC Unit - Pin Mastic	***Yes***	8.7% (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile 8.7 % **Other Material:** Non-fibrous 32.8%			
257 119	223122912-22 **Location:** 1st Floor, MER - HVAC Unit - Pin Mastic		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			
258 120	223122912-23 **Location:** 1st Floor, MER - HVAC Unit - Vibration Cloth - Vinyl	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 6.9%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
259 120	223122912-24 **Location:** 1st Floor, MER - HVAC Unit - Vibration Cloth - Vinyl	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 30.4%			
260 121	223122912-25 **Location:** 1st Floor, MER - At Wall - Green Flange Gasket	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Green, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 60%			
261 121	223122912-26 **Location:** 1st Floor, MER - At Wall - Green Flange Gasket	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Green, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 64.9%			
262 122	223122912-27 **Location:** 1st Floor, MER - At Pumps - Cream	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 64.4%			
263 122	223122912-28 **Location:** 1st Floor, MER - At Pumps - Cream	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 53.2%			
264 123	223122912-29 **Location:** 1st Floor, MER - At Steam Gen. - Red Flange Gasket	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 6.3%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
265 123	223122912-30 **Location:** 1st Floor, MER - At Steam Gen. - Red Flange Gasket	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 6.8%			
266 124	223122912-31 **Location:** 1st Floor, MER - At HVAC - Mudded Fitting @ FG Pipe	***Yes***	23.5% (by NYS ELAP 198.1) by Kensen Caro on 12/29/23
Analyst Description: Off-White, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 23.5 % **Other Material:** Fibrous glass 10%, Non-fibrous 66.5%			
267 124	223122912-32 **Location:** 1st Floor, MER - At Wall - Mudded Fitting @ FG Pipe		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			
268 124	223122912-33 **Location:** 1st Floor, MER - At Ceiling - Mudded Fitting @ FG Pipe		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			
269 125	223122912-34 **Location:** 1st Floor, MER - At Wall - FG With Tar Insulation Wrap	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Silver/Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 13.2%			
270 125	223122912-35 **Location:** 1st Floor, MER - At Wall - FG With Tar Insulation Wrap	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Silver/Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 17.3%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
271 125	223122912-36 **Location:** 1st Floor, MER - At Wall - FG With Tar Insulation Wrap	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Silver/Black, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 22.8%			
272 126	223122912-37 **Location:** 1st Floor, MER - At Water Tank - Exterior - Insulation	***Yes***	26.7% (by NYS ELAP 198.1) by Kensen Caro on 12/29/23
Analyst Description: Gray, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** Chrysotile 20.0 %, Amosite 6.7 % **Other Material:** Non-fibrous 73.3%			
273 126	223122912-38 **Location:** 1st Floor, MER - At Water Tank - Exterior - Insulation		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			
274 126	223122912-39 **Location:** 1st Floor, MER - At Water Tank - Exterior - Insulation		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			
275 127	223122912-40 **Location:** 1st Floor, MER - At Water Tank - Interior Material	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 12/29/23
Analyst Description: Green/Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
276 127	223122912-41 **Location:** 1st Floor, MER - At Water Tank - Interior Material	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 12/29/23
Analyst Description: Green/Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
277 128	223122912-42 **Location:** 1st Floor, MER - At Ceiling - Ceiling Block Material	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 12/29/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 35%, Non-fibrous 65%			
278 128	223122912-43 **Location:** 1st Floor, MER - At Ceiling - Ceiling Block Material	***No***	NAD (by NYS ELAP 198.1) by Kensen Caro on 12/29/23
Analyst Description: Brown, Homogeneous, Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Cellulose 65%, Non-fibrous 35%			
279 129	223122912-44 **Location:** 1st Floor, MER - At Ceiling - Glue Daubs On Concrete	***Yes***	7% (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile 7.0 % **Other Material:** Non-fibrous 29.8%			
280 129	223122912-45 **Location:** 1st Floor, MER - At Ceiling - Glue Daubs On Concrete		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			
281 130	223122912-46 **Location:** 1st Floor, Walk In Cooler Rm. - Red Firestop	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 4.1%			
282 130	223122912-47 **Location:** 1st Floor, Walk In Cooler Rm. - Red Firestop	***No***	NAD (by NYS ELAP 198.6) by Kensen Caro on 12/29/23
Analyst Description: Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.8%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Reporting Notes:

Analyzed by: Kensen Caro
Date: 12/29/2023

Reviewed by: Hongyan Ran

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 229003, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

_____END OF REPORT_____

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

223122912

Site Address: SUNY New Paltz, Dining Hall	Date: 12/27/23	Inspector: David Seddon
1 Hawk Drive	Client Project #	
New Paltz, NY 12561	Project #: KSQ:23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
236	109	1st	Stairwell - Brown Stair Tread			
237	109		-			
238	110		- Stair Tread Adhesive			
239	110		-			
240	111	2	Marketing Managers Office - Carpet Tile Adhesive			
241	111		-			
242	112		- 6" Coveback			
243	112		-			
244	113		- Adhesive			
245	113		-			
246	114		Dinning Area - Sink Coating			
247	114		-			
248	115		All Gender Bathroom - Red HVAC Duct Sealant			
249	115		-			

Special Instructions/ Turnaround Time: 24h TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: 12/28/23 1020
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

223122912

Site Address: SUNY New Paltz, Dining Hall	Date: 12/27/23	Inspector: David Seddon
1 Hawk Drive	Client Project #	
New Paltz, NY 12561	Project #: KSQ:23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
250	116	1st	MER - HVAC UNIT - Top Cover - Cloth			
251	116	↓	↓ - ↓ - ↓ - ↓			
252	117	↓	↓ - ↓ - ↓ - ↓			
253	117	↓	↓ - ↓ - 2nd Cover - Silver			
254	118	↓	↓ - ↓ - ↓ - ↓			
255	118	↓	↓ - ↓ - ↓ - ↓			
256	119	↓	↓ - ↓ - Pin Mastic			
257	119	↓	↓ - ↓ - ↓			
258	120	↓	↓ - ↓ - Vibration Cloth - Vinyl			
259	120	↓	↓ - ↓ - ↓ - ↓			
260	121	↓	↓ - At Wall - Green Flange Gasket			
261	121	↓	↓ - ↓ - ↓ ↓ ↓			
262	122	↓	↓ - At Pumps - Cream ↓ ↓			
263	122	↓	↓ - ↓ ↓ ↓ ↓			

Special Instructions/ Turnaround Time:

24h
TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: Ex Vac 12/28/23 1020
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

223122912

Site Address: SUNY New Paltz, Dining Hall	Date: 12/27/23	Inspector: David Seddon
1 Hawk Drive	Client Project #	
New Paltz, NY 12561	Project #: KSQ:23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
264	123	1st	MEC - AT STEAM GEN - RED FLANGE GASKET			
265	123		-			
266	124		- AT HVAC - Mudded Fitting @ FG Pipe			
267	124		- AT WALL -			
268	124		- AT CEILING -			
269	125		- AT WALL - 8 FG with TAR INSULATION WRAP			
270	125		- -			
271	125		- -			
272	126		- AT WATER TANK - EXTERIOR - INSULATION			
273	126		- - -			
274	126		- - -			
275	127		- - INTERIOR MATERIAL			
276	127		- -			
277	128		- AT CEILING - CEILING BLOCK MATERIAL			

Special Instructions/ Turnaround Time:

24hr
TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: 12/28/23 1020
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

223122912

Site Address: SUNY New Paltz, Dining Hall	Date:	Inspector: David Seddon
1 Hawk Drive	Client Project #	
New Paltz, NY 12561	Project #: KSQ:23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
278	128	1st	MER - AT Ceiling - Ceiling Block Material			
279	129		" - " - Glue Daubs on Concrete			
280	129		" - " - " "			
281	130		~~Walk~~ Walk in Cooler Rm - Red Firestop			
282	130		" " "			
~~283~~	~~131~~		~~" " " Pink Firestop~~			
~~284~~	~~131~~					

Special Instructions/ Turnaround Time:

24h
TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: 12/28/23 1020
Relinquished by:
Received by:

Client Name: Adelaide Environmental Health

Table I
Summary of Bulk Asbestos Analysis Results

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
01	283	131	0.166	40.8	30.0	29.3	NAD	NAD
Location: 1st Fl., Hallway - Pink Firestop								
02	284	131	0.321	40.5	30.1	29.4	NAD	NAD
Location: 1st Fl., Hallway - Pink Firestop								
03	285	132	0.210	7.8	82.0	10.3	NAD	NAD
Location: 1st Fl., Hallway - Ceiling Tile (Textured Type)								
04	286	132	0.170	7.4	81.0	11.6	NAD	NAD
Location: 1st Fl., Hallway - Ceiling Tile (Textured Type)								
05	287	133	0.116	22.4	46.3	31.3	NAD	NAD
Location: 1st Fl., Bakery - Ceiling Tile (Holes)								
06	288	133	0.134	22.6	47.7	29.6	NAD	NAD
Location: 1st Fl., Bakery - Ceiling Tile (Holes)								
07	289	134	0.166	11.5	72.1	16.4	NAD	NAD
Location: 1st Fl., Dry Storage - Ceiling Tile (Texture Paper Type)								
08	290	134	0.306	8.1	84.9	7.1	NAD	NAD
Location: 1st Fl., Dry Storage - Ceiling Tile (Texture Paper Type)								
09	291	135	0.300	59.6	30.1	10.3	NAD	NAD
Location: 1st Fl., North Vestibule - Interior Window Glazing (Gray / Red)								
10	292	136	0.214	58.6	32.2	9.2	NAD	NAD
Location: 1st Fl., North Vestibule - Interior Window Glazing (Gray / Red)								
11	293	137	0.132	68.1	28.8	3.1	NAD	NAD
Location: 1st Fl., North Storefront - Caulking (Top Layer, White)								
12	294	137	0.116	68.7	28.4	2.9	NAD	NAD
Location: 1st Fl., North Storefront - Caulking (Top Layer, White)								
13	295	138	0.175	34.9	6.2	56.0	NAD	Anthophyllite 3.0
Location: 1st Fl., North Storefront - Caulking (Top Layer, Old Red)								
14	296	138	0.244	35.9	4.0	60.1	NAD	NA/PS
Location: 1st Fl., North Storefront - Caulking (Top Layer, Old Red)								
15	297	139	0.109	62.0	36.8	1.2	NAD	NAD
Location: 1st Fl., Exterior - Expansion Joint Caulk (Gray)								
16	298	139	0.117	61.2	37.9	0.9	NAD	NAD
Location: 1st Fl., Exterior - Expansion Joint Caulk (Gray)								

See Reporting notes on last page

Client Name: Adelaide Environmental Health

Table I
Summary of Bulk Asbestos Analysis Results

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

AmeriSci Sample #	Client Sample#	HG Area	Sample Weight (gram)	Heat Sensitive Organic %	Acid Soluble Inorganic %	Insoluble Non-Asbestos Inorganic %	** Asbestos % by PLM/DS	** Asbestos % by TEM
17	299	140	0.747	6.8	51.6	41.6	NAD	NAD
Location: 1st Fl., Exterior - Asphalt Material								
18	300	140	0.774	14.8	44.5	40.7	NAD	NAD
Location: 1st Fl., Exterior - Asphalt Material								
19	301	141	----	----	----	----	NAD	NA
Location: 1st Fl., Exterior Mechanical Room - Material @ Metal Ceiling Seam								
20	302	141	----	----	----	----	NAD	NA
Location: 1st Fl., Exterior Mechanical Room - Material @ Metal Ceiling Seam								
21	303	142	0.221	26.6	39.5	17.0	Chrysotile 17.0	NA
Location: 1st Fl., Exterior Mechanical Room - Waterproofing @ Concrete								
22	304	142	0.160	55.7	14.4	30.0	NA/PS	NA
Location: 1st Fl., Exterior Mechanical Room - Waterproofing @ Concrete								
23	305	143	0.220	31.3	57.2	11.5	NAD	NAD
Location: 1st Fl., Exterior - Brown Caulk @ Storefront Doors (New Doors)								
24	306	143	0.141	73.3	22.8	3.9	NAD	NAD
Location: 1st Fl., Exterior - Brown Caulk @ Exterior Mech. Room Door								

Analyzed by: Hongyan Ran
Date: 12/30/2023

Reviewed by: Hongyan Ran

**Quantitative Analysis (Semi/Full); Bulk Asbestos Analysis - PLM by Appd E to Subpt E, 40 CFR 763 or NYSDOH ELAP 198.1 for New York friable samples or NYSDOH ELAP 198.6 for New York NOB samples; TEM (Semi/Full) by EPA 600/R-93/116 (or NYSDOH ELAP 198.4; for New York samples). Analysis using Hitachi, Model H7000-Noran 7 System, Microscope, Serial #: 747-05-06. NAD = no asbestos detected during a quantitative analysis; NA = not analyzed; Trace = <1%; (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; Quantitation for beginning weights of <0.1 grams should be considered as qualitative only; Qualitative Analysis: Asbestos analysis results of "Present" or "NVA = No Visible Asbestos" represents results for Qualitative PLM or TEM Analysis only (no accreditation coverage available from any regulatory agency for qualitative analyses): NVLAP (PLM) 200546-0, NYSDOH ELAP Lab 11480, NJ Lab ID #NY031.

Warning Note: PLM limitation, only TEM will resolve fibers <0.25 micrometers in diameter. TEM bulk analysis is representative of the fine grained matrix material and may not be representative of non-uniformly dispersed debris for which PLM evaluation is recommended (i.e. soils and other heterogenous materials).

AmeriSci New York
117 EAST 30TH ST.
NEW YORK, NY 10016
TEL: (212) 679-8600 • FAX: (212) 679-3114

PLM Bulk Asbestos Report

Adelaide Environmental Health
Attn: John Soter
1511 Rte. 22 Suite C24

Brewster, NY 10509

Date Received 12/29/23
Date Examined 12/30/23
ELAP # 11480

AmeriSci Job # 223123003
P.O. #
Page 1 **of** 5

RE: KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
283 131	223123003-01 **Location:** 1st Fl., Hallway - Pink Firestop	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Pink, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 29.3%			
284 131	223123003-02 **Location:** 1st Fl., Hallway - Pink Firestop	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Pink, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 29.4%			
285 132	223123003-03 **Location:** 1st Fl., Hallway - Ceiling Tile (Textured Type)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 10.3%			
286 132	223123003-04 **Location:** 1st Fl., Hallway - Ceiling Tile (Textured Type)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 11.6%			
287 133	223123003-05 **Location:** 1st Fl., Bakery - Ceiling Tile (Holes)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 31.3%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
288 133	223123003-06 **Location:** 1st Fl., Bakery - Ceiling Tile (Holes)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 29.6%			
289 134	223123003-07 **Location:** 1st Fl., Dry Storage - Ceiling Tile (Texture Paper Type)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 16.4%			
290 134	223123003-08 **Location:** 1st Fl., Dry Storage - Ceiling Tile (Texture Paper Type)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 7.1%			
291 135	223123003-09 **Location:** 1st Fl., North Vestibule - Interior Window Glazing (Gray / Red)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Gray/Red, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 10.3%			
292 136	223123003-10 **Location:** 1st Fl., North Vestibule - Interior Window Glazing (Gray / Red)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Gray/Red, Heterogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 9.2%			
293 137	223123003-11 **Location:** 1st Fl., North Storefront - Caulking (Top Layer, White)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Off-White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 3.1%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
294 137	223123003-12 **Location:** 1st Fl., North Storefront - Caulking (Top Layer, White)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Off-White, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 2.9%			
295 138	223123003-13 **Location:** 1st Fl., North Storefront - Caulking (Top Layer, Old Red)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 59%			
296 138	223123003-14 **Location:** 1st Fl., North Storefront - Caulking (Top Layer, Old Red)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Red, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 60.1%			
297 139	223123003-15 **Location:** 1st Fl., Exterior - Expansion Joint Caulk (Gray)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 1.2%			
298 139	223123003-16 **Location:** 1st Fl., Exterior - Expansion Joint Caulk (Gray)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Grey, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 0.9%			
299 140	223123003-17 **Location:** 1st Fl., Exterior - Asphalt Material	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 41.6%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
300 140	223123003-18 **Location:** 1st Fl., Exterior - Asphalt Material	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 40.7%			
301 141	223123003-19 **Location:** 1st Fl., Exterior Mechanical Room - Material @ Metal Ceiling Seam	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 12/30/23
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
302 141	223123003-20 **Location:** 1st Fl., Exterior Mechanical Room - Material @ Metal Ceiling Seam	***No***	NAD (by NYS ELAP 198.1) by John P. Koubiadis on 12/30/23
Analyst Description: Grey, Homogeneous, Non-Fibrous, Cementitious, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 100%			
303 142	223123003-21 **Location:** 1st Fl., Exterior Mechanical Room - Waterproofing @ Concrete	***Yes***	17% (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Black, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** Chrysotile 17.0 % **Other Material:** Non-fibrous 16.9%			
304 142	223123003-22 **Location:** 1st Fl., Exterior Mechanical Room - Waterproofing @ Concrete		NA/PS
Analyst Description: Bulk Material **Asbestos Types:** **Other Material:**			
305 143	223123003-23 **Location:** 1st Fl., Exterior - Brown Caulk @ Storefront Doors (New Doors)	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23
Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material **Asbestos Types:** **Other Material:** Non-fibrous 11.5%			

See Reporting notes on last page

PLM Bulk Asbestos Report

KSQ:23261.00-IN; SUNY New Paltz, Dining Hall; 1 Hawk Drive, New Paltz, NY 12561

Client No. / HGA	Lab No.	Asbestos Present	Total % Asbestos
306 143	223123003-24 **Location:** 1st Fl., Exterior - Brown Caulk @ Exterior Mech. Room Door	***No***	NAD (by NYS ELAP 198.6) by John P. Koubiadis on 12/30/23

Analyst Description: Brown, Homogeneous, Non-Fibrous, Bulk Material
Asbestos Types:
Other Material: Non-fibrous 3.9%

Reporting Notes:

Analyzed by: John P. Koubiadis
Date: 12/30/2023

Reviewed by: Hongyan Ran

*NAD/NSD =no asbestos detected; NA =not analyzed; NA/PS=not analyzed/positive stop, (SOF-V) = Sprayed On Fireproofing containing Vermiculite; (SM-V) = Surfacing Material containing Vermiculite; PLM Bulk Asbestos Analysis using Olympus, Model BH-2 Pol Scope, Microscope, Serial #: 223705, by Appd E to Subpt E, 40 CFR 763 quantified by either CVES or 400 pt ct as noted for each analysis (NVLAP 200546-0), ELAP PLM Method 198.1 for NY friable samples, which includes the identification and quantitation of vermiculite, or ELAP 198.6 for NOB samples, or EPA 400 pt ct by EPA 600-M4-82-020 (NY ELAP Lab 11480); Note:PLM is not consistently reliable in detecting asbestos in floor coverings and similar non-friable organically bound materials. NAD or Trace results by PLM are inconclusive, TEM is currently the only method that can be used to determine if this material can be considered or treated as non asbestos-containing in NY State (also see EPA Advisory for floor tile, FR 59,146,38970,8/1/94) National Institute of Standards and Technology Accreditation requirements mandate that this report must not be reproduced except in full without the approval of the lab.This PLM report relates ONLY to the items tested. RI Cert AAL-094, CT Cert PH-0186, Mass Cert AA000054, NJ Lab ID #NY031.

_____END OF REPORT_____

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: SUNY New Paltz, Dining Hall	Date: 12/28/2023	Inspector: David Seddon
1 Hawk Drive	Client Project #	
New Paltz, NY 12561	Project #: KSQ:23261.00-IN	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
283	131	1st	Hallway - Pink Firestop			
284	131		↓ - ↓			
285	132		↓ - Ceiling Tile - Textured Type			
286	132		↓ - ↓ - ↓			
287	133		Bakery - ↓ - Holes			
288	133		↓ - ↓ - ↓			
289	134		Dry Storage - Ceiling Tile - Texture Paper Type			
290	134		↓ - ↓ - ↓			
291	135		North Vestibule - Interior Window Glazing (Gray/Red)			
292	136		↓ - ↓ ↓ ↓			
293	137		North Storefront - Caulking - Top Layer - White			
294	138		↓ - ↓ - ↓ - ↓			
295	138		↓ - ↓ - ↓ - Old Red			
296	138	↓	↓ - ↓ - ↓ - ↓			

Special Instructions/ Turnaround Time: 223123003 24hr TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: J. Neretich 12/29/23 10:05
Relinquished by:
Received by:

Adelaide Environmental Health Associates, Inc
1454 Rte. 22, Suite B202
Brewster, NY 10509
845-278-7710
845-278-7750 - fax

Site Address: SUNY New Paltz, Dining Hall	Date: 12/28/23	Inspector: **David Seddon**
1 Hawk Drive	Client Project #	
New Paltz, NY 12561	Project #: **KSQ:23261.00-IN**	

Sample ID #	Homogeneous Area	Floor Level	Sample Location/Description	Quantity (In Feet)	Friable Non Friable	Condition g, d, sd
297	139	1st	Exterior - Expansion Joint Caulk - Gray			
298	139	↓	↓ - ↓ - ↓			
299	140	↓	↓ - Asphalt Material			
300	140	↓	↓ - ↓			
301	141	↓	Exterior Mechanical Room - Material @ Metal Gray Seams			
302	141	↓	↓ ↓ - ↓ ↓			
303	142	↓	↓ ↓ - Waterproofing @ Concrete			
304	142	↓	↓ ↓ - ↓			
305	143	↓	Exterior - Brown Caulk @ Storefront Doors (New Doors)			
306	143	↓	↓ - ↓ @ Exterior Mech Room Door			
	2231230	03				

Special Instructions/ Turnaround Time:

24h
TAT

Stop at 1st Positive per Homogenous Area
Fax Results to 845-278-7750
E-Mail results to AdelaideLabResults@Adelaidellc.com

Relinquished by:
Received by: J. Neretich 12/29/23 10:05
Relinquished by:
Received by:

APPENDIX E

XRF READINGS

Adelaide ENVIRONMENTAL HEALTH

Adelaide Environmental Heath Associates Inc.
1511 Route 22, Suite C-24
Brewster, New York 10509
Adelaide Project# KSQ:23261.00-IN
Project Name: SUNY New Paltz - Peregrine Dining Hall
Inspector: David Seddon

Reading #	Date	Time	Space Type	Floor	Room	Component	Side	Substrate	Color	Condition	Lead Concentration (mg/cm2)	Result
1	11/24/2023	11:05:20	Dining Hall		Calibration						1.1	Positive
2	11/24/2023	11:05:36	Dining Hall		Calibration						1	Positive
3	11/24/2023	11:05:51	Dining Hall		Calibration						1	Positive
4	**11/24/2023**	**11:07:08**	**Dining Hall**	**1st Floor**	**Men's Bathroom**	**Structural Beam**	**Ceiling**	**Metal**	**Red**	**Poor**	**4.6**	**Positive**
5	11/24/2023	11:08:10	Dining Hall	1st Floor	Men's Bathroom	Door Case	A	Metal	Grey	Poor	0.2	Negative
6	11/24/2023	11:08:27	Dining Hall	1st Floor	Men's Bathroom	Door	A	Metal	Grey	Poor	0.1	Negative
7	11/24/2023	11:08:53	Dining Hall	1st Floor	Men's Bathroom	Wall	B	Ceramic	Blue	Poor	0	Negative
8	11/24/2023	11:09:13	Dining Hall	1st Floor	Men's Bathroom	Wall	B	Ceramic	Orange	Poor	0.1	Negative
9	11/24/2023	11:09:28	Dining Hall	1st Floor	Men's Bathroom	Wall	B	Ceramic	Cream	Poor	0	Negative
10	**11/24/2023**	**11:12:28**	**Dining Hall**	**1st Floor**	**Men's Bathroom**	**Wall**	**C**	**Ceramic**	**Cream**	**Poor**	**14.9**	**Positive**
11	11/24/2023	11:13:31	Dining Hall	1st Floor	Bathroom Hallway	Wall	C	Plaster	Off White	Poor	0.5	Negative
12	11/24/2023	11:13:45	Dining Hall	1st Floor	Bathroom Hallway	Wall	B	Plaster	Off White	Poor	0.2	Negative
13	11/24/2023	11:14:24	Dining Hall	1st Floor	Storage D	Door Case	A	Metal	Grey	Poor	0.3	Negative
14	11/24/2023	11:14:35	Dining Hall	1st Floor	Storage D	Door	A	Metal	Grey	Poor	0.1	Negative
15	11/24/2023	11:15:18	Dining Hall	1st Floor	Storage C	Door	A	Wood	Grey	Poor	0	Negative
16	11/24/2023	11:15:35	Dining Hall	1st Floor	Storage C	Door Case	A	Metal	Grey	Poor	0.2	Negative
17	11/24/2023	11:16:23	Dining Hall		Calibration						1	Positive
18	11/24/2023	11:16:59	Dining Hall		Calibration						0.9	Negative
19	11/24/2023	11:17:15	Dining Hall		Calibration						1	Positive
20	12/26/2023	13:28:27	Dining Hall		Calibration						1.1	Positive
21	12/26/2023	13:28:43	Dining Hall		Calibration						1.1	Positive
22	12/26/2023	13:28:58	Dining Hall		Calibration						1.1	Positive
23	12/26/2023	13:29:56	Dining Hall	2nd Floor	Storage Room	Door Case	A	Metal	Blue	Intact	0.7	Negative
24	**12/26/2023**	**13:30:14**	**Dining Hall**	**2nd Floor**	**Storage Room**	**Door**	**A**	**Metal**	**Blue**	**Intact**	**1.2**	**Positive**
25	12/26/2023	13:30:41	Dining Hall	2nd Floor	Storage Room	Wall Lower	A	CMU	Off White	Intact	0.3	Negative
26	12/26/2023	13:30:59	Dining Hall	2nd Floor	Storage Room	Wall Lower	D	CMU	Yellow	Intact	0.2	Negative
27	12/26/2023	13:31:18	Dining Hall	2nd Floor	Storage Room	Wall Upper	D	CMU	Red	Intact	0.2	Negative
28	**12/26/2023**	**13:31:58**	**Dining Hall**	**2nd Floor**	**Storage Room**	**Structural Beam**	**Ceiling**	**Metal**	**Off White**	**Poor**	**4**	**Positive**
29	12/26/2023	13:32:38	Dining Hall	2nd Floor	Storage Room	Roof Deck	Ceiling	Metal	Off White	Poor	0.3	Negative
30	12/26/2023	13:33:38	Dining Hall	2nd Floor	Storage Room	Conduit	Ceiling	Metal	Off White	Poor	0.4	Negative
31	12/26/2023	13:36:01	Dining Hall	2nd Floor	Locker Room	Ceiling	Ceiling	Metal	Off White	Poor	0.1	Negative
32	12/26/2023	13:36:27	Dining Hall	2nd Floor	Locker Room	Door Case	A	Metal	Blue	Poor	0.4	Negative
33	**12/26/2023**	**13:36:55**	**Dining Hall**	**2nd Floor**	**Locker Room**	**Wall Lower**	**A**	**Ceramic**	**Cream**	**Fair**	**13.5**	**Positive**
34	12/26/2023	13:37:44	Dining Hall	2nd Floor	Locker Room	Wall Middle	A	CMU	Off White	Fair	0.4	Negative
35	12/26/2023	13:38:04	Dining Hall	2nd Floor	Locker Room	Wall Upper	A	CMU	Red	Fair	0.1	Negative
36	**12/26/2023**	**13:38:30**	**Dining Hall**	**2nd Floor**	**Locker Room**	**Door**	**D**	**Wood**	**Blue**	**Fair**	**1.2**	**Positive**
37	12/26/2023	14:04:34	Dining Hall	2nd Floor	Wash Area	Door	A	Metal	Blue	Fair	0.1	Negative
38	12/26/2023	14:04:51	Dining Hall	2nd Floor	Wash Area	Door Case	A	Metal	Blue	Fair	0.5	Negative
39	12/26/2023	14:05:28	Dining Hall	2nd Floor	Wash Area	Ductwork	Ceiling	Metal	White	Poor	0.1	Negative
40	12/26/2023	14:06:10	Dining Hall	2nd Floor	Wash Area	Door Case	D	Metal	Blue	Poor	0.4	Negative
41	12/26/2023	14:06:22	Dining Hall	2nd Floor	Wash Area	Door	D	Metal	Blue	Poor	0.1	Negative
42	12/26/2023	14:06:51	Dining Hall	2nd Floor	Wash Area	Casework	A	Metal	Off White	Poor	0.1	Negative

Adelaide Environmental Heath Associates Inc.
1511 Route 22, Suite C-24
Brewster, New York 10509
Adelaide Project# KSQ:23261.00-IN
Project Name: SUNY New Paltz - Peregrine Dining Hall
Inspector: David Seddon

Reading #	Date	Time	Space Type	Floor	Room	Component	Side	Substrate	Color	Condition	Lead Concentration (mg/cm2)	Result
43	12/26/2023	14:08:32	Dining Hall	2nd Floor	Office	Door Case	A	Metal	Grey	Fair	0.3	Negative
44	12/26/2023	14:08:45	Dining Hall	2nd Floor	Office	Door	A	Metal	Grey	Fair	0	Negative
45	12/26/2023	14:09:07	Dining Hall	2nd Floor	Office	Wall	A	Sheetrock	Off White	Fair	0.2	Negative
46	12/26/2023	14:09:26	Dining Hall	2nd Floor	Office	Wall	C	CMU	Off White	Fair	0.5	Negative
47	12/26/2023	14:09:43	Dining Hall	2nd Floor	Office	Wall	C	Wood	Off White	Fair	0.7	Negative
48	12/26/2023	14:10:29	Dining Hall	2nd Floor	Office	Window Case	C	Metal	Brown	Fair	0.3	Negative
49	12/27/2023	10:33:59	Dining Hall		Calibration						1.2	Positive
50	12/27/2023	10:34:16	Dining Hall		Calibration						1.1	Positive
51	12/27/2023	10:34:32	Dining Hall		Calibration						1.1	Positive
52	12/27/2023	10:36:28	Dining Hall	2nd Floor	Marketing Manager Office	Wall	A	Sheetrock	Grey	Fair	0.2	Negative
53	12/27/2023	10:36:43	Dining Hall	2nd Floor	Marketing Manager Office	Wall	A	Plaster	Grey	Fair	0.1	Negative
54	12/27/2023	10:37:04	Dining Hall	2nd Floor	Marketing Manager Office	Door Case	A	Metal	Grey	Fair	0.3	Negative
55	12/27/2023	10:37:22	Dining Hall	2nd Floor	Marketing Manager Office	Radiator	D	Metal	Grey	Fair	0.3	Negative
56	12/27/2023	10:37:45	Dining Hall	2nd Floor	Marketing Manager Office	Window Case	D	Metal	Off White	Fair	0.3	Negative
57	12/27/2023	10:38:14	Dining Hall	2nd Floor	Marketing Manager Office	Column	C	Plaster	Off White	Fair	0.1	Negative
58	12/27/2023	10:39:59	Dining Hall	2nd Floor	Dinning Area	Column	Center	Plaster	Off White	Fair	0.2	Negative
59	12/27/2023	10:40:33	Dining Hall	2nd Floor	Dinning Area	Wall	B	Sheetrock	Orange	Fair	0	Negative
60	12/27/2023	10:40:50	Dining Hall	2nd Floor	Dinning Area	Wall	B	Sheetrock	Blue	Fair	0.1	Negative
61	12/27/2023	10:41:09	Dining Hall	2nd Floor	Dinning Area	Wall	C	Sheetrock	Off White	Fair	0.3	Negative
62	12/27/2023	10:41:30	Dining Hall	2nd Floor	Dinning Area	Wall	B	Plaster	Off White	Fair	0.2	Negative
63	12/27/2023	10:41:49	Dining Hall	2nd Floor	Dinning Area	Wall	B	Plaster	Blue	Fair	0.2	Negative
64	12/27/2023	10:42:03	Dining Hall	2nd Floor	Dinning Area	Wall	B	Wood	Blue	Fair	0.4	Negative
65	12/27/2023	10:42:32	Dining Hall	2nd Floor	Dinning Area	Window Case	B	Metal	Off White	Fair	0.1	Negative
66	12/27/2023	10:42:50	Dining Hall	2nd Floor	Dinning Area	Radiator	B	Metal	Off White	Fair	0.1	Negative
67	12/27/2023	10:45:26	Dining Hall	2nd Floor	Dinning Area	HVAC Cover	Ceiling	Metal	Off White	Poor	0.2	Negative
68	12/27/2023	10:45:53	Dining Hall	2nd Floor	Dinning Area	Ceiling	Ceiling	Plaster	Off White	Fair	0.4	Negative
69	12/27/2023	10:47:36	Dining Hall	2nd Floor	Operations Manager Office	Wall	A	Sheetrock	Grey	Fair	0.2	Negative
70	12/27/2023	10:47:53	Dining Hall	2nd Floor	Operations Manager Office	Door Case	A	Metal	Grey	Fair	0.3	Negative
71	12/27/2023	10:48:12	Dining Hall	2nd Floor	Operations Manager Office	Window Case	B	Metal	Grey	Fair	0.5	Negative
72	12/27/2023	10:49:26	Dining Hall	2nd Floor	Dinning Area	Door Case	B	Metal	Off White	Fair	0.5	Negative
73	12/27/2023	10:49:38	Dining Hall	2nd Floor	Dinning Area	Door	B	Metal	Off White	Fair	0.1	Negative
74	12/27/2023	10:55:01	Dining Hall	2nd Floor	Registered Dietitian Office	Radiator	B	Metal	Off White	Fair	0.2	Negative
75	12/27/2023	10:55:19	Dining Hall	2nd Floor	Registered Dietitian Office	Window Case	B	Metal	Off White	Fair	0.2	Negative
76	12/27/2023	10:55:44	Dining Hall	2nd Floor	Registered Dietitian Office	Wall	B	Plaster	Grey	Fair	0.1	Negative
77	12/27/2023	10:56:03	Dining Hall	2nd Floor	Registered Dietitian Office	Wall	A	Sheetrock	Grey	Fair	0.1	Negative
78	12/27/2023	10:57:39	Dining Hall	2nd Floor	Simple Zone	Wall	A	Sheetrock	Off White	Fair	0.2	Negative
79	12/27/2023	10:57:57	Dining Hall	2nd Floor	Simple Zone	Wall	A	Sheetrock	Grey	Fair	0.2	Negative
80	12/27/2023	10:58:19	Dining Hall	2nd Floor	Simple Zone	Door Case	A	Metal	Grey	Fair	0.1	Negative
81	12/27/2023	10:58:31	Dining Hall	2nd Floor	Simple Zone	Door	A	Metal	Grey	Fair	0.1	Negative
82	12/27/2023	11:06:23	Dining Hall	2nd Floor	Kitchen	Door	A	Metal	Blue	Fair	0.2	Negative
83	12/27/2023	11:06:37	Dining Hall	2nd Floor	Kitchen	Door Trim	A	Metal	Blue	Fair	0.2	Negative
84	12/27/2023	11:07:06	Dining Hall	2nd Floor	Kitchen	Window Case	C	Metal	Blue	Fair	0.4	Negative

Adelaide Environmental Heath Associates Inc.
1511 Route 22, Suite C-24
Brewster, New York 10509
Adelaide Project# KSQ:23261.00-IN
Project Name: SUNY New Paltz - Peregrine Dining Hall
Inspector: David Seddon

Reading #	Date	Time	Space Type	Floor	Room	Component	Side	Substrate	Color	Condition	Lead Concentration (mg/cm2)	Result
85	12/27/2023	11:07:30	Dining Hall	2nd Floor	Kitchen	Wall	C	Ceramic	Cream	Fair	0.5	Negative
86	12/27/2023	11:07:56	Dining Hall	2nd Floor	Kitchen	Wall	C	Ceramic	Cream	Fair	0.4	Negative
87	12/27/2023	11:08:50	Dining Hall	2nd Floor	Kitchen	Electrical Panel	A	Metal	Red	Fair	0.1	Negative
88	12/27/2023	11:12:48	Dining Hall		Calibration						1	Positive
89	12/27/2023	11:13:05	Dining Hall		Calibration						1	Positive
90	12/27/2023	11:13:22	Dining Hall		Calibration						1	Positive
91	12/27/2023	14:02:45	Dining Hall		Calibration						1.2	Positive
92	12/27/2023	14:03:01	Dining Hall		Calibration						1.2	Positive
93	12/27/2023	14:03:17	Dining Hall		Calibration						1.1	Positive
94	**12/27/2023**	**14:05:05**	**Dining Hall**	**1st Floor**	**MER**	**Structural Beam**	**Center**	**Metal**	**Cream**	**Fair**	**4.9**	**Positive**
95	12/27/2023	14:05:39	Dining Hall	1st Floor	MER	HVAC	Center	Metal	Cream	Fair	0.2	Negative
96	12/27/2023	14:06:08	Dining Hall	1st Floor	MER	Wall	A	CMU	Cream	Fair	0.3	Negative
97	12/27/2023	14:06:29	Dining Hall	1st Floor	MER	Wall	D	Concrete	Cream	Fair	0.5	Negative
98	12/27/2023	14:07:00	Dining Hall	1st Floor	MER	Door Case	A	Metal	Cream	Fair	0.3	Negative
99	12/27/2023	14:07:12	Dining Hall	1st Floor	MER	Door	A	Metal	Cream	Fair	0.2	Negative
100	12/27/2023	14:08:21	Dining Hall	1st Floor	MER	Stair Handrail	A	Metal	Grey	Fair	0.2	Negative
101	**12/27/2023**	**14:09:14**	**Dining Hall**	**1st Floor**	**Stairwell**	**Stair Handrail**	**A**	**Metal**	**Blue**	**Fair**	**1.5**	**Positive**
102	12/27/2023	14:09:32	Dining Hall	1st Floor	Stairwell	Stair Stringer	A	Metal	Blue	Fair	0.7	Negative
103	**12/27/2023**	**14:09:46**	**Dining Hall**	**1st Floor**	**Stairwell**	**Stair Riser**	**A**	**Metal**	**Blue**	**Fair**	**1.5**	**Positive**
104	**12/27/2023**	**14:10:02**	**Dining Hall**	**1st Floor**	**Stairwell**	**Door Case**	**A**	**Metal**	**Blue**	**Fair**	**2.7**	**Positive**
105	12/27/2023	14:10:21	Dining Hall	1st Floor	Stairwell	Door	A	Metal	Blue	Fair	0.1	Negative
106	12/27/2023	14:10:36	Dining Hall	1st Floor	Stairwell	Door	A	Metal	Grey	Fair	0.2	Negative
107	12/27/2023	14:11:58	Dining Hall	1st Floor	Hallway	Wall	C	CMU	White	Fair	0.2	Negative
108	12/27/2023	15:00:18	Dining Hall		Calibration						1.2	Positive
109	12/27/2023	15:00:34	Dining Hall		Calibration						1.1	Positive
110	12/27/2023	15:00:51	Dining Hall		Calibration						1.1	Positive
111	12/28/2023	10:15:40	Dining Hall		Calibration						1.2	Positive
112	12/28/2023	10:15:51	Dining Hall		Calibration						1.2	Positive
113	12/28/2023	10:16:08	Dining Hall		Calibration						1.2	Positive
114	12/28/2023	10:17:13	Dining Hall	1st Floor	Dry Storage	Door Case	B	Metal	Grey	Fair	0.6	Negative
115	12/28/2023	10:17:25	Dining Hall	1st Floor	Dry Storage	Door	B	Metal	Grey	Fair	0	Negative
116	12/28/2023	10:17:49	Dining Hall	1st Floor	Dry Storage	Wall	A	Sheetrock	Off White	Fair	0	Negative
117	12/28/2023	10:23:40	Dining Hall	1st Floor	110 Walk in Coolers	Wall	A	Sheetrock	Off White	Fair	0.2	Negative
118	12/28/2023	10:23:59	Dining Hall	1st Floor	110 Walk in Coolers	Wall	C	Concrete	Off White	Fair	0.4	Negative
119	12/28/2023	10:24:27	Dining Hall	1st Floor	110 Walk in Coolers	Door Case	A	Metal	Grey	Fair	0.2	Negative
120	12/28/2023	10:24:39	Dining Hall	1st Floor	110 Walk in Coolers	Door	A	Metal	Grey	Fair	0.1	Negative
121	12/28/2023	10:25:15	Dining Hall	1st Floor	Small Storage	Door	A	Metal	Grey	Fair	0.2	Negative
122	**12/28/2023**	**10:25:27**	**Dining Hall**	**1st Floor**	**Small Storage**	**Door Case**	**A**	**Metal**	**Grey**	**Fair**	**1.1**	**Positive**
123	12/28/2023	10:26:00	Dining Hall	1st Floor	Small Storage	Wall	A	CMU	Green	Fair	0.4	Negative
124	12/28/2023	10:36:14	Dining Hall	1st Floor	Storage A	Wall	A	Sheetrock	White	Fair	0.1	Negative
125	12/28/2023	10:37:11	Dining Hall	1st Floor	Storage A	Door Case	A	Metal	Grey	Fair	0.2	Negative
126	12/28/2023	10:37:24	Dining Hall	1st Floor	Storage A	Door	A	Metal	Grey	Fair	0.3	Negative

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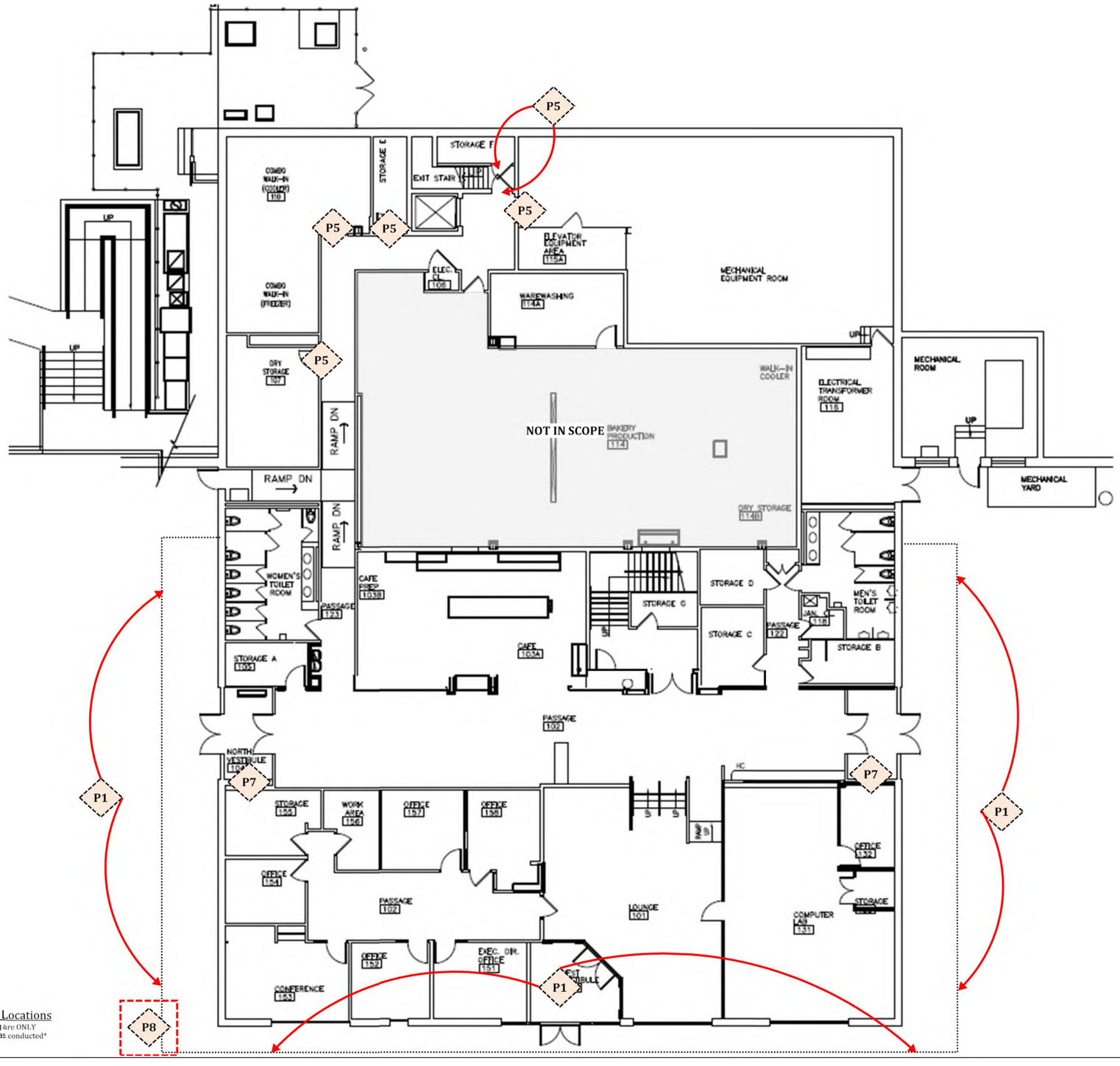
Adelaide Project# KSQ:23261.00-IN
Project Name: SUNY New Paltz - Peregrine Dining Hall
Inspector: David Seddon

Reading #	Date	Time	Space Type	Floor	Room	Component	Side	Substrate	Color	Condition	Lead Concentration (mg/cm2)	Result
127	12/28/2023	10:39:26	Dining Hall	1st Floor	Passage 102	Ceiling	Ceiling	Sheetrock	Off White	Fair	0.2	Negative
128	12/28/2023	10:49:15	Dining Hall	1st Floor	Exterior	Window Case	North	Metal	Red	Poor	0.4	Negative
129	12/28/2023	10:51:07	Dining Hall	1st Floor	Exterior	Soffit	North	Transite	Cream	Poor	0.1	Negative
130	12/28/2023	11:01:11	Dining Hall		Calibration						1.1	Positive
131	12/28/2023	11:01:26	Dining Hall		Calibration						1.1	Positive
132	12/28/2023	11:01:42	Dining Hall		Calibration						1.1	Positive
133	**12/28/2023**	**11:52:57**	**Dining Hall**		**Exterior**	**Door Lintel**	**East**	**Metal**	**Red**	**Fair**	**6.6**	**Positive**
134	12/28/2023	11:53:22	Dining Hall		Exterior	Window Case	East	Metal	Blue	Fair	0.2	Negative
135	**12/28/2023**	**11:53:45**	**Dining Hall**		**Exterior**	**Window Lintel**	**East**	**Metal**	**Black**	**Fair**	**6**	**Positive**
136	12/28/2023	11:54:54	Dining Hall		Exterior	Dock Post	East	Metal	Yellow	Poor	0.7	Negative
137	12/28/2023	11:55:19	Dining Hall		Exterior	Dock Guard	East	Metal	Yellow	Poor	0.2	Negative
138	12/28/2023	11:55:34	Dining Hall		Calibration						1.1	Positive
139	12/28/2023	11:55:49	Dining Hall		Calibration						1	Positive
140	12/28/2023	11:56:05	Dining Hall		Calibration						1	Positive

APPENDIX F

PCB LOCATION MAP(S)



First Floor Plan - Limited PCB Locations

PCB locations identified on this drawing are ONLY limited to the dates of the inspection that was conducted

Drawing Not to Scale

PCB LEGEND: (see report for details)	
P1	Gray Caulking at Stone Facade
P2	Gray Caulking at Windowsill
P3	Red Caulking at Window
P4	Black Window Glazing - Interior
P5	Cream Caulk at Interior Door Frames
P6	Dark Gray Caulk at Terrazzo Basin
P7	Gray Windowpane Glazing - Interior
P8	PCB in Soil

Adelaide ENVIRONMENTAL HEALTH

1511 Route 22
Brewster, NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

CLIENT:
KSQ Design
215 West 40th Street,
15th Floor
New York, New York 10018

SUNY Project #
081056

SURVEY LOCATION:
SUNY New Paltz
Peregrine Dining Hall
1 Hawk Drive
New Paltz, New York 12561

DATE: 01/12/2023

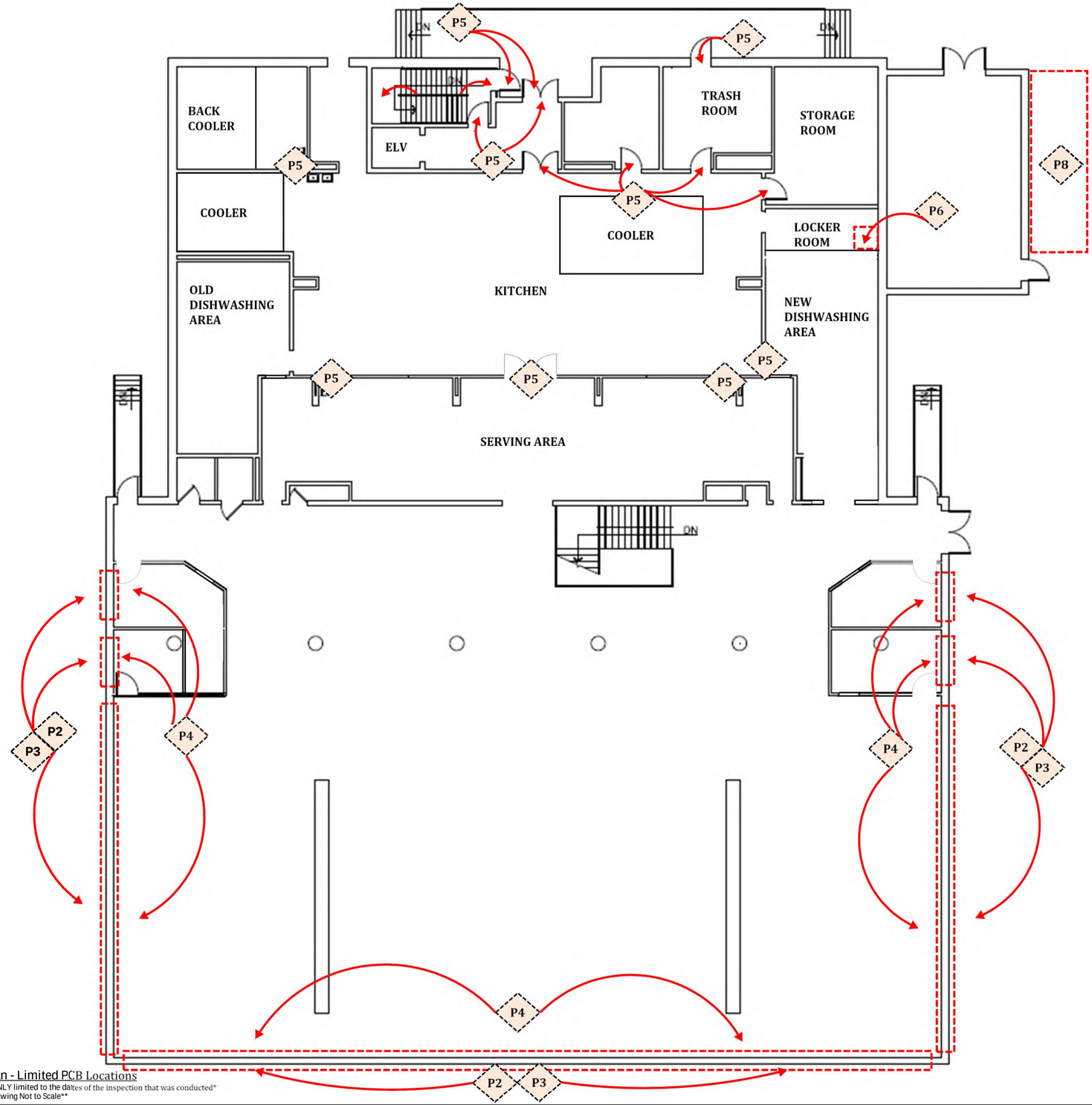
DRAWING VERSION: No. 1

ISSUED FOR:
Renovation HazMat Survey

ADELAIDE PROJECT NO.:
KSQ:23261.00-IN

DRAWING PREPARED BY:
DWS

PCB-01



Second Floor Plan - Limited PCB Locations

PCB locations identified on this drawing are ONLY limited to the dates of the inspection that was conducted

Drawing Not to Scale

PCB LEGEND: (see report for details)	
P1	Gray Caulking at Stone Facade
P2	Gray Caulking at Windowsill
P3	Red Caulking at Window
P4	Black Window Glazing - Interior
P5	Cream Caulk at Interior Door Frames
P6	Dark Gray Caulk at Terrazzo Basin
P7	Gray Windowpane Glazing - Interior
P8	Soil with PCB

Adelaide ENVIRONMENTAL HEALTH
1511 Route 22
Brewster, NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

CLIENT:
KSQ Design
215 West 40th Street,
15th Floor
New York, New York 10018

SUCF Project #
081056

SURVEY LOCATION:
SUNY New Paltz
Peregrine Dining Hall
1 Hawk Drive
New Paltz, New York 12561

DATE: 01/13/2023

DRAWING VERSION: No. 1

ISSUED FOR:
Renovation HazMat Survey

ADELAIDE PROJECT NO.:
KSQ:23261.00-IN

DRAWING PREPARED BY:
DWS

PCB-02

APPENDIX G

PCB ANALYTICAL RESULTS

PHOENIX
Environmental Laboratories, Inc.

Friday, December 08, 2023

Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL
SDG ID: GCP54735
Sample ID#s: CP54735 - CP54739

This laboratory is in compliance with the NELAC requirements of procedures used except where indicated.

This report contains results for the parameters tested, under the sampling conditions described on the Chain Of Custody, as received by the laboratory. This report is incomplete unless all pages indicated in the pagination at the bottom of the page are included.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

A scanned version of the COC form accompanies the analytical report and is an exact duplicate of the original.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200. The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Sincerely yours,

Phyllis Shiller
Laboratory Director

NELAC - #NY11301
CT Lab Registration #PH-0618
MA Lab Registration #M-CT007
ME Lab Registration #CT-007
NH Lab Registration #213693-A,B
NJ Lab Registration #CT-003
NY Lab Registration #11301
PA Lab Registration #68-03530
RI Lab Registration #63
VT Lab Registration #VT11301

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Sample Id Cross Reference

December 08, 2023

SDG I.D.: GCP54735

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL

Client Id	Lab Id	Matrix
PCB-1	CP54735	CAULK
PCB-2	CP54736	CAULK
PCB-3	CP54737	CAULK
PCB-4	CP54738	CAULK
PCB-5	CP54739	CAULK

PHOENIX
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ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

December 08, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		11/21/23	
Location Code:	ADELAIDE	Received by:	SR1	11/28/23	16:18
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP54735
Phoenix ID: CP54735

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL
Client ID: PCB-1

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				11/28/23	R/P/AC1	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	930	ug/Kg	2	11/29/23	SC	SW8082A
PCB-1221	ND	930	ug/Kg	2	11/29/23	SC	SW8082A
PCB-1232	ND	930	ug/Kg	2	11/29/23	SC	SW8082A
PCB-1242	ND	930	ug/Kg	2	11/29/23	SC	SW8082A
PCB-1248	ND	930	ug/Kg	2	11/29/23	SC	SW8082A
PCB-1254	1400	930	ug/Kg	2	11/29/23	SC	SW8082A
PCB-1260	ND	930	ug/Kg	2	11/29/23	SC	SW8082A
PCB-1262	ND	930	ug/Kg	2	11/29/23	SC	SW8082A
PCB-1268	ND	930	ug/Kg	2	11/29/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	70		%	2	11/29/23	SC	30 - 150 %
% DCBP (Confirmation)	78		%	2	11/29/23	SC	30 - 150 %
% TCMX	55		%	2	11/29/23	SC	30 - 150 %
% TCMX (Confirmation)	59		%	2	11/29/23	SC	30 - 150 %

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL

Phoenix I.D.: CP54735

Client ID: PCB-1

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Phyllis Shiller, Laboratory Director

December 08, 2023

Reviewed and Released by: Phyllis Shiller, Laboratory Director

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

December 08, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		11/21/23	
Location Code:	ADELAIDE	Received by:	SR1	11/28/23	16:18
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP54735
Phoenix ID: CP54736

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL
Client ID: PCB-2

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference	
Caulk Extraction for PCB	Completed				11/28/23	R/P/AC1	SW3540C	
PCB (Soxhlet SW3540C)								
PCB-1016	ND	960	ug/Kg	2	11/29/23	SC	SW8082A	
PCB-1221	ND	960	ug/Kg	2	11/29/23	SC	SW8082A	
PCB-1232	ND	960	ug/Kg	2	11/29/23	SC	SW8082A	
PCB-1242	ND	960	ug/Kg	2	11/29/23	SC	SW8082A	
PCB-1248	ND	960	ug/Kg	2	11/29/23	SC	SW8082A	
PCB-1254	2200	960	ug/Kg	2	11/29/23	SC	SW8082A	
PCB-1260	ND	960	ug/Kg	2	11/29/23	SC	SW8082A	
PCB-1262	ND	960	ug/Kg	2	11/29/23	SC	SW8082A	
PCB-1268	ND	960	ug/Kg	2	11/29/23	SC	SW8082A	
QA/QC Surrogates								
% DCBP	68		%	2	11/29/23	SC	30 - 150 %	
% DCBP (Confirmation)	69		%	2	11/29/23	SC	30 - 150 %	
% TCMX	28		%	2	11/29/23	SC	30 - 150 %	3
% TCMX (Confirmation)	28		%	2	11/29/23	SC	30 - 150 %	3

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL

Phoenix I.D.: CP54736

Client ID: PCB-2

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

3 = This parameter exceeds laboratory specified limits.

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

PCB comment:
The TCMX surrogate recovery was below acceptance criteria. A significant bias is not suspected because the DCBP recovery was within criteria.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Phyllis Shiller, Laboratory Director

December 08, 2023

Reviewed and Released by: Phyllis Shiller, Laboratory Director

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

December 08, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		11/21/23	
Location Code:	ADELAIDE	Received by:	SR1	11/28/23	16:18
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP54735
Phoenix ID: CP54737

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL
Client ID: PCB-3

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				11/28/23	R/P/AC1	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	750	ug/Kg	2	11/29/23	SC	SW8082A
PCB-1221	ND	750	ug/Kg	2	11/29/23	SC	SW8082A
PCB-1232	ND	750	ug/Kg	2	11/29/23	SC	SW8082A
PCB-1242	ND	750	ug/Kg	2	11/29/23	SC	SW8082A
PCB-1248	ND	750	ug/Kg	2	11/29/23	SC	SW8082A
PCB-1254	940	750	ug/Kg	2	11/29/23	SC	SW8082A
PCB-1260	ND	750	ug/Kg	2	11/29/23	SC	SW8082A
PCB-1262	ND	750	ug/Kg	2	11/29/23	SC	SW8082A
PCB-1268	ND	750	ug/Kg	2	11/29/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	75		%	2	11/29/23	SC	30 - 150 %
% DCBP (Confirmation)	71		%	2	11/29/23	SC	30 - 150 %
% TCMX	65		%	2	11/29/23	SC	30 - 150 %
% TCMX (Confirmation)	60		%	2	11/29/23	SC	30 - 150 %

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL

Phoenix I.D.: CP54737

Client ID: PCB-3

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Phyllis Shiller, Laboratory Director

December 08, 2023

Reviewed and Released by: Phyllis Shiller, Laboratory Director

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

December 08, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		11/21/23	
Location Code:	ADELAIDE	Received by:	SR1	11/28/23	16:18
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP54735
Phoenix ID: CP54738

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL
Client ID: PCB-4

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				12/04/23	R/PL	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	1000	ug/Kg	5	12/05/23	SC	SW8082A
PCB-1221	ND	1000	ug/Kg	5	12/05/23	SC	SW8082A
PCB-1232	ND	1000	ug/Kg	5	12/05/23	SC	SW8082A
PCB-1242	ND	1000	ug/Kg	5	12/05/23	SC	SW8082A
PCB-1248	ND	1000	ug/Kg	5	12/05/23	SC	SW8082A
PCB-1254	ND	1000	ug/Kg	5	12/05/23	SC	SW8082A
PCB-1260	ND	1000	ug/Kg	5	12/05/23	SC	SW8082A
PCB-1262	ND	1000	ug/Kg	5	12/05/23	SC	SW8082A
PCB-1268	ND	1000	ug/Kg	5	12/05/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	143		%	5	12/05/23	SC	30 - 150 %
% DCBP (Confirmation)	72		%	5	12/05/23	SC	30 - 150 %
% TCMX	87		%	5	12/05/23	SC	30 - 150 %
% TCMX (Confirmation)	79		%	5	12/05/23	SC	30 - 150 %

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL

Phoenix I.D.: CP54738

Client ID: PCB-4

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

PCB Comment:
For PCBs, due to matrix interference from non target compounds in the sample, multiple cleanup steps were performed. The extract was cleaned up with a combination of sulfuric acid, potassium permanganate, copper powder and additional florisil. Poor surrogate recovery was observed.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
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Phyllis Shiller, Laboratory Director

December 08, 2023

Reviewed and Released by: Phyllis Shiller, Laboratory Director

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

December 08, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		11/22/23	
Location Code:	ADELAIDE	Received by:	SR1	11/28/23	16:18
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP54735
Phoenix ID: CP54739

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL
Client ID: PCB-5

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				11/28/23	R/P/AC1	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	8700000	ug/Kg	20000	11/30/23	SC	SW8082A
PCB-1221	ND	8700000	ug/Kg	20000	11/30/23	SC	SW8082A
PCB-1232	ND	8700000	ug/Kg	20000	11/30/23	SC	SW8082A
PCB-1242	ND	8700000	ug/Kg	20000	11/30/23	SC	SW8082A
PCB-1248	ND	8700000	ug/Kg	20000	11/30/23	SC	SW8082A
PCB-1254	41000000	8700000	ug/Kg	20000	11/30/23	SC	SW8082A
PCB-1260	ND	8700000	ug/Kg	20000	11/30/23	SC	SW8082A
PCB-1262	ND	8700000	ug/Kg	20000	11/30/23	SC	SW8082A
PCB-1268	ND	8700000	ug/Kg	20000	11/30/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	Diluted Out		%	20000	11/30/23	SC	30 - 150 %
% DCBP (Confirmation)	Diluted Out		%	20000	11/30/23	SC	30 - 150 %
% TCMX	Diluted Out		%	20000	11/30/23	SC	30 - 150 %
% TCMX (Confirmation)	Diluted Out		%	20000	11/30/23	SC	30 - 150 %

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL

Phoenix I.D.: CP54739

Client ID: PCB-5

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Phyllis Shiller, Laboratory Director

December 08, 2023

Reviewed and Released by: Phyllis Shiller, Laboratory Director

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

QA/QC Report

December 08, 2023

QA/QC Data

SDG I.D.: GCP54735

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits
QA/QC Batch 707828 (ug/Kg), QC Sample No: CP53463 10X (CP54735, CP54736, CP54737, CP54739)										
Polychlorinated Biphenyls										
PCB-1016	ND	170	65	69	6.0				40 - 140	30
PCB-1221	ND	170							40 - 140	30
PCB-1232	ND	170							40 - 140	30
PCB-1242	ND	170							40 - 140	30
PCB-1248	ND	170							40 - 140	30
PCB-1254	ND	170							40 - 140	30
PCB-1260	ND	170	67	69	2.9				40 - 140	30
PCB-1262	ND	170							40 - 140	30
PCB-1268	ND	170							40 - 140	30
% DCBP (Surrogate Rec)	66	%	73	73	0.0				30 - 150	30
% DCBP (Surrogate Rec) (Confirm	68	%	69	75	8.3				30 - 150	30
% TCMX (Surrogate Rec)	30	%	59	66	11.2				30 - 150	30
% TCMX (Surrogate Rec) (Confirm	30	%	59	65	9.7				30 - 150	30

Comment:

A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.

QA/QC Batch 708669 (ug/Kg), QC Sample No: CP54738 10X (CP54738)										
Polychlorinated Biphenyls										
PCB-1016	ND	170	89	102	13.6				40 - 140	30
PCB-1221	ND	170							40 - 140	30
PCB-1232	ND	170							40 - 140	30
PCB-1242	ND	170							40 - 140	30
PCB-1248	ND	170							40 - 140	30
PCB-1254	ND	170							40 - 140	30
PCB-1260	ND	170	87	104	17.8				40 - 140	30
PCB-1262	ND	170							40 - 140	30
PCB-1268	ND	170							40 - 140	30
% DCBP (Surrogate Rec)	96	%	89	99	10.6				30 - 150	30
% DCBP (Surrogate Rec) (Confirm	95	%	89	99	10.6				30 - 150	30
% TCMX (Surrogate Rec)	92	%	85	95	11.1				30 - 150	30
% TCMX (Surrogate Rec) (Confirm	91	%	85	96	12.2				30 - 150	30

Comment:

A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.

QA/QC Data

SDG I.D.: GCP54735

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

RPD - Relative Percent Difference
LCS - Laboratory Control Sample
LCSD - Laboratory Control Sample Duplicate
MS - Matrix Spike
MS Dup - Matrix Spike Duplicate
NC - No Criteria
Intf - Interference

Phyllis Shiller, Laboratory Director
December 08, 2023

Friday, December 08, 2023

Criteria: None

State: NY

Sample Criteria Exceedances Report

GCP54735 - ADELAIDE

SampNo	Acode	Phoenix Analyte	Criteria	Result	RL	Criteria	RL Criteria	Analysis Units
CP54735	$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	1400	930	1000	1000	ug/Kg
CP54736	$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	2200	960	1000	1000	ug/Kg
CP54739	$PCB_SOXR	PCB-1268	NY / Requested PCB RL /	ND	8700000	1000	1000	ug/Kg
CP54739	$PCB_SOXR	PCB-1262	NY / Requested PCB RL /	ND	8700000	1000	1000	ug/Kg
CP54739	$PCB_SOXR	PCB-1260	NY / Requested PCB RL /	ND	8700000	1000	1000	ug/Kg
CP54739	$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	41000000	8700000	1000	1000	ug/Kg
CP54739	$PCB_SOXR	PCB-1248	NY / Requested PCB RL /	ND	8700000	1000	1000	ug/Kg
CP54739	$PCB_SOXR	PCB-1242	NY / Requested PCB RL /	ND	8700000	1000	1000	ug/Kg
CP54739	$PCB_SOXR	PCB-1232	NY / Requested PCB RL /	ND	8700000	1000	1000	ug/Kg
CP54739	$PCB_SOXR	PCB-1221	NY / Requested PCB RL /	ND	8700000	1000	1000	ug/Kg
CP54739	$PCB_SOXR	PCB-1016	NY / Requested PCB RL /	ND	8700000	1000	1000	ug/Kg

Phoenix Laboratories does not assume responsibility for the data contained in this exceedance report. It is provided as an additional tool to identify requested criteria exceedences. All efforts are made to ensure the accuracy of the data (obtained from appropriate agencies). A lack of exceedence information does not necessarily suggest conformance to the criteria. It is ultimately the site professional's responsibility to determine appropriate compliance.

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Comments

December 08, 2023 SDG I.D.: GCP54735

The following analysis comments are made regarding exceptions to criteria not already noted in the Analysis Report or QA/QC Report:

PCB Narration

AU-ECD1 11/29/23-1: CP54735, CP54736, CP54737

The following Continuing Calibration compounds did not meet % deviation criteria:
Samples: CP54735, CP54736, CP54737
Preceding CC N29A034 - DCBP SURR 23%H (15%), PCB 1016 17%L (%)
Succeeding CC N29A046 - DCBP SURR 27%H (15%), PCB 1016 28%L (%)
Samples: CP54735, CP54736, CP54737
Preceding CC N29B034 - None.
Succeeding CC N29B046 - DCBP SURR 16%H (15%)

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NY Temperature Narration

December 08, 2023

SDG I.D.: GCP54735

The samples in this delivery group were received at 1.6°C.
(Note acceptance criteria for relevant matrices is above freezing up to 6°C)

Cooler: Yes [ ] No [ ]
Coolant: IPK [ ] ICE [ ] No [ ]
Temp 1.0 °C . Pg of

PHOENIX Environmental Laboratories, Inc.

NY/NJ/PA CHAIN OF CUSTODY RECORD

587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040
Email: Makrina Nolan, makrina@phoenixlabs.com Fax (860) 645-0823
Client Services (860) 645-1102

Contact Options:
[ ] Phone:
[ ] Fax:
[X] Email: adelaidelabresults@adelaidemail.com

Customer: Adelaide Environmental
Address: 1511 Route 22, Suite C24
Brewster, New York 10509

Project: SUNY New Paltz - Peregrine Dining Hall
Report to:
Invoice to:
QUOTE # :

Project P.O: KSQ:23261.00-IN

This section MUST be completed with Bottle Quantities.

Client Sample - Information - Identification

Sampler's Signature: [signature] Date: 11/27/23

Matrix Code:
DW=Drinking Water **GW**=Ground Water **SW**=Surface Water **WW**=Waste Water
RW=Raw Water **SE**=Sediment **SL**=Sludge **S**=Soil **SD**=Solid **W**=Wipe
OIL=Oil **B**=Bulk **L**=Liquid

Analysis Request

PHOENIX USE ONLY SAMPLE #	Customer Sample Identification	Sample Matrix	Date Sampled	Time Sampled	*MS/MSD (May be billable at analysis unit rate)	PCB
54735	PCB-1	B	11/21/2023			X
	Middle Roof Louver - Caulking - Top Layer					
54736	PCB-2	B	11/21/2023			X
	Middle Roof Louver - Caulking - Bottom Layer					
54737	PCB-3	B	11/21/2023			X
	Lower Furnace Roof - Caulking at Exhaust Pipe					
54738	PCB-4	B	11/21/2023			X
	Middle Roof - Caulking at Exhaust Unit					
54739	PCB-5	B	11/22/2023			X
	Exterior - Caulking at Facia Stone					

Columns: GL Amber 8 oz. [ ] w/H_2PO_4 [ ] $NAHSO_4$; Soil VOA Vials [ ] methanol [ ] H_2O; GL Soil container ( ) oz; GL Soil container ( ) oz; 40 ml VOA Vial [ ] As is [ ] HCl; GL Amber 1000ml [ ] As is [ ] H_2SO_4; PL As is [ ] 250ml [ ] 500ml [ ] 1000ml; PL H_2SO_4 [ ] 250ml [ ] 500ml; PL NAOH 250ml; PL HNO_3 250ml; Bacteria Bottle w/thio; Bacteria Bottle as is

Relinquished by:	Accepted by:	Date:	Time:
[signature]	[signature]	11/27/23	1500
[signature]	[signature]	11/28/23	1618

Comments, Special Requirements or Regulations:

David Seddon

***MS/MSD are considered site samples and will be billed as such in accordance with the prices quoted.**

Data Format:
[ ] Phoenix Std Report
[ ] Excel
[ ] PDF
[ ] GIS/Key
[ ] EQuIS
[ ] NJ Hazsite EDD
[ ] NY EZ EDD (ASP)
[ ] Other

Turnaround:
[ ] 1 Day*
[ ] 2 Days*
[ ] 3 Days*
[ ] 4 Days*
[ ] 5 Days*
[X] Standard
* SURCHARGE APPLIES

Data Package:
[ ] NJ Reduced Deliv. *
[ ] NY Enhanced (ASP B) *
[ ] Other

NJ
[ ] Res. Criteria
[ ] Non-Res. Criteria
[ ] Impact to GW Soil Cleanup Criteria
[ ] Impact to GW soil screen Criteria
[ ] GW Criteria

NY
[ ] TOGS GW
[ ] CP-51 SOIL
[ ] 375SCO Unrestricted Soil
[ ] 375SCO Residential Soil
[ ] 375SCO Residential Restricted Soil
[ ] 375SCO Commercial Soil
[ ] 375SCO Industrial Soil
[ ] Subpart 5 DW

PA
[ ] Clean Fill Limits
[ ] PA-GW
[ ] Reg Fill Limits
[ ] PA Soil Restricted
[ ] PA Soil non-restricted

State Samples Collected? NY

PHOENIX
Environmental Laboratories, Inc.

Thursday, November 30, 2023

Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL
SDG ID: GCP54740
Sample ID#s: CP54740 - CP54743

This laboratory is in compliance with the NELAC requirements of procedures used except where indicated.

This report contains results for the parameters tested, under the sampling conditions described on the Chain Of Custody, as received by the laboratory. This report is incomplete unless all pages indicated in the pagination at the bottom of the page are included.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

A scanned version of the COC form accompanies the analytical report and is an exact duplicate of the original.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200. The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Sincerely yours,

Phyllis Shiller
Laboratory Director

NELAC - #NY11301
CT Lab Registration #PH-0618
MA Lab Registration #M-CT007
ME Lab Registration #CT-007
NH Lab Registration #213693-A,B
NJ Lab Registration #CT-003
NY Lab Registration #11301
PA Lab Registration #68-03530
RI Lab Registration #63
VT Lab Registration #VT11301

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ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Sample Id Cross Reference

November 30, 2023

SDG I.D.: GCP54740

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL

Client Id	Lab Id	Matrix
PCB-6	CP54740	CAULK
PCB-7	CP54741	CAULK
PCB-8	CP54742	CAULK
PCB-9	CP54743	CAULK

PHOENIX
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ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

November 30, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		11/22/23	
Location Code:	ADELAIDE	Received by:	SR1	11/28/23	16:18
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP54740
Phoenix ID: CP54740

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL
Client ID: PCB-6

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				11/28/23	R/P/AC1	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	8600000	ug/Kg	10000	11/29/23	SC	SW8082A
PCB-1221	ND	8600000	ug/Kg	10000	11/29/23	SC	SW8082A
PCB-1232	ND	8600000	ug/Kg	10000	11/29/23	SC	SW8082A
PCB-1242	ND	8600000	ug/Kg	10000	11/29/23	SC	SW8082A
PCB-1248	ND	8600000	ug/Kg	10000	11/29/23	SC	SW8082A
PCB-1254	99000000	8600000	ug/Kg	10000	11/29/23	SC	SW8082A
PCB-1260	ND	8600000	ug/Kg	10000	11/29/23	SC	SW8082A
PCB-1262	ND	8600000	ug/Kg	10000	11/29/23	SC	SW8082A
PCB-1268	ND	8600000	ug/Kg	10000	11/29/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	Diluted Out		%	10000	11/29/23	SC	30 - 150 %
% DCBP (Confirmation)	Diluted Out		%	10000	11/29/23	SC	30 - 150 %
% TCMX	Diluted Out		%	10000	11/29/23	SC	30 - 150 %
% TCMX (Confirmation)	Diluted Out		%	10000	11/29/23	SC	30 - 150 %

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL

Phoenix I.D.: CP54740

Client ID: PCB-6

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
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Phyllis Shiller, Laboratory Director

November 30, 2023

Reviewed and Released by: Anil Makol, Project Manager

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

November 30, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		11/22/23	
Location Code:	ADELAIDE	Received by:	SR1	11/28/23	16:18
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP54740
Phoenix ID: CP54741

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL
Client ID: PCB-7

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				11/28/23	R/P/AC1	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	3400000	ug/Kg	5000	11/29/23	SC	SW8082A
PCB-1221	ND	3400000	ug/Kg	5000	11/29/23	SC	SW8082A
PCB-1232	ND	3400000	ug/Kg	5000	11/29/23	SC	SW8082A
PCB-1242	ND	3400000	ug/Kg	5000	11/29/23	SC	SW8082A
PCB-1248	ND	3400000	ug/Kg	5000	11/29/23	SC	SW8082A
PCB-1254	37000000	3400000	ug/Kg	5000	11/29/23	SC	SW8082A
PCB-1260	ND	3400000	ug/Kg	5000	11/29/23	SC	SW8082A
PCB-1262	ND	3400000	ug/Kg	5000	11/29/23	SC	SW8082A
PCB-1268	ND	3400000	ug/Kg	5000	11/29/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	Diluted Out		%	5000	11/29/23	SC	30 - 150 %
% DCBP (Confirmation)	Diluted Out		%	5000	11/29/23	SC	30 - 150 %
% TCMX	Diluted Out		%	5000	11/29/23	SC	30 - 150 %
% TCMX (Confirmation)	Diluted Out		%	5000	11/29/23	SC	30 - 150 %

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL

Phoenix I.D.: CP54741

Client ID: PCB-7

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
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Phyllis Shiller, Laboratory Director

November 30, 2023

Reviewed and Released by: Anil Makol, Project Manager

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

November 30, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		11/22/23	
Location Code:	ADELAIDE	Received by:	SR1	11/28/23	16:18
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP54740
Phoenix ID: CP54742

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL
Client ID: PCB-8

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				11/28/23	R/P/AC1	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	910	ug/Kg	1	11/29/23	SC	SW8082A
PCB-1221	ND	910	ug/Kg	1	11/29/23	SC	SW8082A
PCB-1232	ND	910	ug/Kg	1	11/29/23	SC	SW8082A
PCB-1242	ND	910	ug/Kg	1	11/29/23	SC	SW8082A
PCB-1248	ND	910	ug/Kg	1	11/29/23	SC	SW8082A
PCB-1254	3000	910	ug/Kg	1	11/29/23	SC	SW8082A
PCB-1260	ND	910	ug/Kg	1	11/29/23	SC	SW8082A
PCB-1262	ND	910	ug/Kg	1	11/29/23	SC	SW8082A
PCB-1268	ND	910	ug/Kg	1	11/29/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	57		%	1	11/29/23	SC	30 - 150 %
% DCBP (Confirmation)	58		%	1	11/29/23	SC	30 - 150 %
% TCMX	44		%	1	11/29/23	SC	30 - 150 %
% TCMX (Confirmation)	56		%	1	11/29/23	SC	30 - 150 %

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL

Phoenix I.D.: CP54742

Client ID: PCB-8

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Phyllis Shiller, Laboratory Director

November 30, 2023

Reviewed and Released by: Anil Makol, Project Manager

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

November 30, 2023

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		11/22/23	
Location Code:	ADELAIDE	Received by:	SR1	11/28/23	16:18
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP54740
Phoenix ID: CP54743

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL
Client ID: PCB-9

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				11/28/23	R/P/AC1	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	260000	ug/Kg	500	11/29/23	SC	SW8082A
PCB-1221	ND	260000	ug/Kg	500	11/29/23	SC	SW8082A
PCB-1232	ND	260000	ug/Kg	500	11/29/23	SC	SW8082A
PCB-1242	ND	260000	ug/Kg	500	11/29/23	SC	SW8082A
PCB-1248	ND	260000	ug/Kg	500	11/29/23	SC	SW8082A
PCB-1254	1600000	260000	ug/Kg	500	11/29/23	SC	SW8082A
PCB-1260	ND	260000	ug/Kg	500	11/29/23	SC	SW8082A
PCB-1262	ND	260000	ug/Kg	500	11/29/23	SC	SW8082A
PCB-1268	ND	260000	ug/Kg	500	11/29/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	Diluted Out		%	500	11/29/23	SC	30 - 150 %
% DCBP (Confirmation)	Diluted Out		%	500	11/29/23	SC	30 - 150 %
% TCMX	Diluted Out		%	500	11/29/23	SC	30 - 150 %
% TCMX (Confirmation)	Diluted Out		%	500	11/29/23	SC	30 - 150 %

Project ID: SUNY NEW PALTZ - PEREGRINE DINING HALL

Phoenix I.D.: CP54743

Client ID: PCB-9

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

PCB Comment:
For PCBs, in order to reach the desired RL, multiple cleanup steps were performed. The extract was cleaned up with a combination of sulfuric acid, potassium permanganate, copper powder and additional florisil.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Phyllis Shiller, Laboratory Director
November 30, 2023
Reviewed and Released by: Anil Makol, Project Manager

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

QA/QC Report

November 30, 2023

QA/QC Data

SDG I.D.: GCP54740

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits	
QA/QC Batch 707828 (ug/Kg), QC Sample No: CP53463 10X (CP54740, CP54741, CP54742, CP54743)											
Polychlorinated Biphenyls											
PCB-1016	ND	170	65	69	6.0				40 - 140	30	
PCB-1221	ND	170							40 - 140	30	
PCB-1232	ND	170							40 - 140	30	
PCB-1242	ND	170							40 - 140	30	
PCB-1248	ND	170							40 - 140	30	
PCB-1254	ND	170							40 - 140	30	
PCB-1260	ND	170	67	69	2.9				40 - 140	30	
PCB-1262	ND	170							40 - 140	30	
PCB-1268	ND	170							40 - 140	30	
% DCBP (Surrogate Rec)	66	%	73	73	0.0				30 - 150	30	
% DCBP (Surrogate Rec) (Confirm	68	%	69	75	8.3				30 - 150	30	
% TCMX (Surrogate Rec)	28	%	59	66	11.2				30 - 150	30	s
% TCMX (Surrogate Rec) (Confirm	28	%	59	65	9.7				30 - 150	30	s

Comment:

A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.

s = This parameter is outside laboratory Blank Surrogate specified recovery limits.

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

RPD - Relative Percent Difference
LCS - Laboratory Control Sample
LCSD - Laboratory Control Sample Duplicate
MS - Matrix Spike
MS Dup - Matrix Spike Duplicate
NC - No Criteria
Intf - Interference

Phyllis Shiller, Laboratory Director
November 30, 2023

Thursday, November 30, 2023

Criteria: None

State: NY

Sample Criteria Exceedances Report

GCP54740 - ADELAIDE

SampNo	Acode	Phoenix Analyte	Criteria	Result	RL	Criteria	RL Criteria	Analysis Units
CP54740	$PCB_SOXR	PCB-1221	NY / Requested PCB RL /	ND	8600000	1000	1000	ug/Kg
CP54740	$PCB_SOXR	PCB-1232	NY / Requested PCB RL /	ND	8600000	1000	1000	ug/Kg
CP54740	$PCB_SOXR	PCB-1242	NY / Requested PCB RL /	ND	8600000	1000	1000	ug/Kg
CP54740	$PCB_SOXR	PCB-1248	NY / Requested PCB RL /	ND	8600000	1000	1000	ug/Kg
CP54740	$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	99000000	8600000	1000	1000	ug/Kg
CP54740	$PCB_SOXR	PCB-1260	NY / Requested PCB RL /	ND	8600000	1000	1000	ug/Kg
CP54740	$PCB_SOXR	PCB-1262	NY / Requested PCB RL /	ND	8600000	1000	1000	ug/Kg
CP54740	$PCB_SOXR	PCB-1268	NY / Requested PCB RL /	ND	8600000	1000	1000	ug/Kg
CP54740	$PCB_SOXR	PCB-1016	NY / Requested PCB RL /	ND	8600000	1000	1000	ug/Kg
CP54741	$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	37000000	3400000	1000	1000	ug/Kg
CP54741	$PCB_SOXR	PCB-1016	NY / Requested PCB RL /	ND	3400000	1000	1000	ug/Kg
CP54741	$PCB_SOXR	PCB-1221	NY / Requested PCB RL /	ND	3400000	1000	1000	ug/Kg
CP54741	$PCB_SOXR	PCB-1232	NY / Requested PCB RL /	ND	3400000	1000	1000	ug/Kg
CP54741	$PCB_SOXR	PCB-1248	NY / Requested PCB RL /	ND	3400000	1000	1000	ug/Kg
CP54741	$PCB_SOXR	PCB-1260	NY / Requested PCB RL /	ND	3400000	1000	1000	ug/Kg
CP54741	$PCB_SOXR	PCB-1262	NY / Requested PCB RL /	ND	3400000	1000	1000	ug/Kg
CP54741	$PCB_SOXR	PCB-1268	NY / Requested PCB RL /	ND	3400000	1000	1000	ug/Kg
CP54741	$PCB_SOXR	PCB-1242	NY / Requested PCB RL /	ND	3400000	1000	1000	ug/Kg
CP54742	$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	3000	910	1000	1000	ug/Kg
CP54743	$PCB_SOXR	PCB-1268	NY / Requested PCB RL /	ND	260000	1000	1000	ug/Kg
CP54743	$PCB_SOXR	PCB-1016	NY / Requested PCB RL /	ND	260000	1000	1000	ug/Kg
CP54743	$PCB_SOXR	PCB-1221	NY / Requested PCB RL /	ND	260000	1000	1000	ug/Kg
CP54743	$PCB_SOXR	PCB-1232	NY / Requested PCB RL /	ND	260000	1000	1000	ug/Kg
CP54743	$PCB_SOXR	PCB-1242	NY / Requested PCB RL /	ND	260000	1000	1000	ug/Kg
CP54743	$PCB_SOXR	PCB-1248	NY / Requested PCB RL /	ND	260000	1000	1000	ug/Kg
CP54743	$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	1600000	260000	1000	1000	ug/Kg
CP54743	$PCB_SOXR	PCB-1260	NY / Requested PCB RL /	ND	260000	1000	1000	ug/Kg
CP54743	$PCB_SOXR	PCB-1262	NY / Requested PCB RL /	ND	260000	1000	1000	ug/Kg

Phoenix Laboratories does not assume responsibility for the data contained in this exceedance report. It is provided as an additional tool to identify requested criteria exceedences. All efforts are made to ensure the accuracy of the data (obtained from appropriate agencies). A lack of exceedence information does not necessarily suggest conformance to the criteria. It is ultimately the site professional's responsibility to determine appropriate compliance.

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Comments

November 30, 2023 SDG I.D.: GCP54740

The following analysis comments are made regarding exceptions to criteria not already noted in the Analysis Report or QA/QC Report:

PCB Narration

AU-ECD1 11/29/23-1: CP54740, CP54742, CP54743

The following Continuing Calibration compounds did not meet % deviation criteria:
Samples: CP54740, CP54742, CP54743
Preceding CC N29B034 - None.
Succeeding CC N29B046 - DCBP SURR 16%H (15%)

AU-ECD24 11/29/23-1: CP54741

The following Continuing Calibration compounds did not meet % deviation criteria:
Samples: CP54741
Preceding CC N29A016 - PCB 1260 23%H (%)
Succeeding CC N29A029 - PCB 1260 16%H (%), TCMX SURR 18%H (15%)

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NY Temperature Narration

November 30, 2023

SDG I.D.: GCP54740

The samples in this delivery group were received at 1.6°C.
(Note acceptance criteria for relevant matrices is above freezing up to 6°C)

Cooler: Yes ☑ No ☐
Coolant: IPK ☑ ICE ☐ No ☐
Temp: 4.0 °C Pg of

PHOENIX Environmental Laboratories, Inc.

NY/NJ/PA CHAIN OF CUSTODY RECORD

587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040
Email: Makrina Nolan, makrina@phoenixlabs.com Fax (860) 645-0823
Client Services (860) 645-1102

Contact Options:
☐ Phone:
☐ Fax:
☒ Email: adelaidelabresults@adelaidemail.com

Customer: Adelaide Environmental
Address: 1511 Route 22, Suite C24
Brewster, New York 10509

Project: SUNY New Paltz - Peregrine Dining Hall
Report to:
Invoice to:
QUOTE # :

Project P.O: KSQ:23261.00-IN

This section MUST be completed with Bottle Quantities.

Client Sample - Information - Identification

Sampler's Signature: Date: 11/27/23

Matrix Code:
DW=Drinking Water **GW**=Ground Water **SW**=Surface Water **WW**=Waste Water
RW=Raw Water **SE**=Sediment **SL**=Sludge **S**=Soil **SD**=Solid **W**=Wipe
OIL=Oil **B**=Bulk **L**=Liquid

Analysis Request

PHOENIX USE ONLY SAMPLE #	Customer Sample Identification	Sample Matrix	Date Sampled	Time Sampled	*MS/MSD (May be billable at analysis unit rate)	PCB
54740	PCB-6	B	11/22/2023			X
	Exterior - Caulking at Window Sill					
54741	PCB-7	B	11/22/2023			X
	Exterior - Caulking at Window					
54742	PCB-8	B	11/22/2023			X
	Mens Bathroom - Caulking at Fixtures					
54743	PCB-9	B	11/22/2023			X
	Office - Interior Window Glazing					

Columns: GL Amber 8 oz. [ ] w/H_3PO_4 [ ] $NAHSO_4$; Soil VOA Vials [ ] methanol [ ] H_2O; GL Soil container ( ) oz; GL Soil container ( ) oz; 40 ml VOA Vial [ ] As is [ ] HCl; GL Amber 1000ml [ ] As is [ ] H_2SO_4; PL As is [ ] 250ml [ ] 500ml [ ] 1000ml; PL H_2SO_4 [ ] 250ml [ ] 500ml; PL NAOH 250ml; PL HNO_3 250ml; Bacteria Bottle w/thio; Bacteria Bottle as is

Relinquished by:	Accepted by:	Date:	Time:
		11/27/23	1500
		11/28/23	1618

Comments, Special Requirements or Regulations:

DAVID SEDDON

***MS/MSD are considered site samples and will be billed as such in accordance with the prices quoted.**

Data Format:
☐ Phoenix Std Report ☐ EQuIS
☐ Excel ☐ NJ Hazsite EDD
☐ PDF ☐ NY EZ EDD (ASP)
☐ GIS/Key ☐ Other

Turnaround:
☐ 1 Day*
☐ 2 Days*
☐ 3 Days*
☐ 4 Days*
☐ 5 Days*
☒ Standard
* SURCHARGE APPLIES

NJ
☐ Res. Criteria
☐ Non-Res. Criteria
☐ Impact to GW Soil Cleanup Criteria
☐ Impact to GW soil screen Criteria
☐ GW Criteria

Data Package:
☐ NJ Reduced Deliv. *
☐ NY Enhanced (ASP B) *
☐ Other

NY
☐ TOGS GW
☐ CP-51 SOIL
☐ 375SCO Unrestricted Soil
☐ 375SCO Residential Soil
☐ 375SCO Residential Restricted Soil
☐ 375SCO Commercial Soil
☐ 375SCO Industrial Soil
☐ Subpart 5 DW

PA
☐ Clean Fill Limits
☐ PA-GW
☐ Reg Fill Limits
☐ PA Soil Restricted
☐ PA Soil non-restricted

State Samples Collected? NY

Wednesday, January 03, 2024

Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Project ID: SUNY NEW PALTZ, DINING HALL
SDG ID: GCP76249
Sample ID#s: CP76249 - CP76253

This laboratory is in compliance with the NELAC requirements of procedures used except where indicated.

This report contains results for the parameters tested, under the sampling conditions described on the Chain Of Custody, as received by the laboratory. This report is incomplete unless all pages indicated in the pagination at the bottom of the page are included.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

A scanned version of the COC form accompanies the analytical report and is an exact duplicate of the original.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200. The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Sincerely yours,

Phyllis Shiller
Laboratory Director

NELAC - #NY11301
CT Lab Registration #PH-0618
MA Lab Registration #M-CT007
ME Lab Registration #CT-007
NH Lab Registration #213693-A,B
NJ Lab Registration #CT-003
NY Lab Registration #11301
PA Lab Registration #68-03530
RI Lab Registration #63
VT Lab Registration #VT11301

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ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Sample Id Cross Reference

January 03, 2024

SDG I.D.: GCP76249

Project ID: SUNY NEW PALTZ, DINING HALL

Client Id	Lab Id	Matrix
PCB-13	CP76249	CAULK
PCB-14	CP76250	CAULK
PCB-15	CP76251	CAULK
PCB-16	CP76252	CAULK
PCB-17	CP76253	CAULK

PHOENIX
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ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

January 03, 2024

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		12/28/23	
Location Code:	ADELAIDE	Received by:	CP	12/29/23	13:01
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP76249
Phoenix ID: CP76249

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-13

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				12/29/23	B/RB	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	28000000	ug/Kg	100000	01/02/24	SC	SW8082A
PCB-1221	ND	28000000	ug/Kg	100000	01/02/24	SC	SW8082A
PCB-1232	ND	28000000	ug/Kg	100000	01/02/24	SC	SW8082A
PCB-1242	ND	28000000	ug/Kg	100000	01/02/24	SC	SW8082A
PCB-1248	ND	28000000	ug/Kg	100000	01/02/24	SC	SW8082A
PCB-1254	78000000	28000000	ug/Kg	100000	01/02/24	SC	SW8082A
PCB-1260	ND	28000000	ug/Kg	100000	01/02/24	SC	SW8082A
PCB-1262	ND	28000000	ug/Kg	100000	01/02/24	SC	SW8082A
PCB-1268	ND	28000000	ug/Kg	100000	01/02/24	SC	SW8082A
QA/QC Surrogates							
% DCBP	Diluted Out		%	100000	01/02/24	SC	30 - 150 %
% DCBP (Confirmation)	Diluted Out		%	100000	01/02/24	SC	30 - 150 %
% TCMX	Diluted Out		%	100000	01/02/24	SC	30 - 150 %
% TCMX (Confirmation)	Diluted Out		%	100000	01/02/24	SC	30 - 150 %

Project ID: SUNY NEW PALTZ, DINING HALL

Client ID: PCB-13

Phoenix I.D.: CP76249

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

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Phyllis Shiller, Laboratory Director

January 03, 2024

Reviewed and Released by: Anil Makol, Project Manager

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ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

January 03, 2024

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		12/28/23	
Location Code:	ADELAIDE	Received by:	CP	12/29/23	13:01
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP76249
Phoenix ID: CP76250

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-14

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				12/29/23	B/RB	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	430	ug/Kg	2	01/02/24	SC	SW8082A
PCB-1221	ND	430	ug/Kg	2	01/02/24	SC	SW8082A
PCB-1232	ND	430	ug/Kg	2	01/02/24	SC	SW8082A
PCB-1242	ND	430	ug/Kg	2	01/02/24	SC	SW8082A
PCB-1248	ND	430	ug/Kg	2	01/02/24	SC	SW8082A
PCB-1254	3900	430	ug/Kg	2	01/02/24	SC	SW8082A
PCB-1260	ND	430	ug/Kg	2	01/02/24	SC	SW8082A
PCB-1262	ND	430	ug/Kg	2	01/02/24	SC	SW8082A
PCB-1268	ND	430	ug/Kg	2	01/02/24	SC	SW8082A
QA/QC Surrogates							
% DCBP	55		%	2	01/02/24	SC	30 - 150 %
% DCBP (Confirmation)	58		%	2	01/02/24	SC	30 - 150 %
% TCMX	58		%	2	01/02/24	SC	30 - 150 %
% TCMX (Confirmation)	58		%	2	01/02/24	SC	30 - 150 %

Project ID: SUNY NEW PALTZ, DINING HALL

Client ID: PCB-14

Phoenix I.D.: CP76250

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
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Comments:

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Phyllis Shiller, Laboratory Director

January 03, 2024

Reviewed and Released by: Anil Makol, Project Manager

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ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

January 03, 2024

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		12/28/23	
Location Code:	ADELAIDE	Received by:	CP	12/29/23	13:01
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP76249
Phoenix ID: CP76251

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-15

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				12/29/23	B/RB	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	710	ug/Kg	1	01/02/24	SC	SW8082A
PCB-1221	ND	710	ug/Kg	1	01/02/24	SC	SW8082A
PCB-1232	ND	710	ug/Kg	1	01/02/24	SC	SW8082A
PCB-1242	ND	710	ug/Kg	1	01/02/24	SC	SW8082A
PCB-1248	ND	710	ug/Kg	1	01/02/24	SC	SW8082A
PCB-1254	5500	710	ug/Kg	1	01/02/24	SC	SW8082A
PCB-1260	ND	710	ug/Kg	1	01/02/24	SC	SW8082A
PCB-1262	ND	710	ug/Kg	1	01/02/24	SC	SW8082A
PCB-1268	ND	710	ug/Kg	1	01/02/24	SC	SW8082A
QA/QC Surrogates							
% DCBP	60		%	1	01/02/24	SC	30 - 150 %
% DCBP (Confirmation)	65		%	1	01/02/24	SC	30 - 150 %
% TCMX	46		%	1	01/02/24	SC	30 - 150 %
% TCMX (Confirmation)	62		%	1	01/02/24	SC	30 - 150 %

Project ID: SUNY NEW PALTZ, DINING HALL

Client ID: PCB-15

Phoenix I.D.: CP76251

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
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Comments:

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Phyllis Shiller, Laboratory Director

January 03, 2024

Reviewed and Released by: Anil Makol, Project Manager

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ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

January 03, 2024

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		12/28/23	
Location Code:	ADELAIDE	Received by:	CP	12/29/23	13:01
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP76249
Phoenix ID: CP76252

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-16

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				12/29/23	B/RB	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	750	ug/Kg	1	01/02/24	SC	SW8082A
PCB-1221	ND	750	ug/Kg	1	01/02/24	SC	SW8082A
PCB-1232	ND	750	ug/Kg	1	01/02/24	SC	SW8082A
PCB-1242	ND	750	ug/Kg	1	01/02/24	SC	SW8082A
PCB-1248	ND	750	ug/Kg	1	01/02/24	SC	SW8082A
PCB-1254	3300	750	ug/Kg	1	01/02/24	SC	SW8082A
PCB-1260	ND	750	ug/Kg	1	01/02/24	SC	SW8082A
PCB-1262	ND	750	ug/Kg	1	01/02/24	SC	SW8082A
PCB-1268	ND	750	ug/Kg	1	01/02/24	SC	SW8082A
QA/QC Surrogates							
% DCBP	59		%	1	01/02/24	SC	30 - 150 %
% DCBP (Confirmation)	64		%	1	01/02/24	SC	30 - 150 %
% TCMX	44		%	1	01/02/24	SC	30 - 150 %
% TCMX (Confirmation)	58		%	1	01/02/24	SC	30 - 150 %

Project ID: SUNY NEW PALTZ, DINING HALL

Client ID: PCB-16

Phoenix I.D.: CP76252

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

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Phyllis Shiller, Laboratory Director

January 03, 2024

Reviewed and Released by: Anil Makol, Project Manager

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Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

January 03, 2024

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		12/28/23	
Location Code:	ADELAIDE	Received by:	CP	12/29/23	13:01
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP76249
Phoenix ID: CP76253

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-17

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				12/29/23	B/RB	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	1000	ug/Kg	2	01/02/24	SC	SW8082A
PCB-1221	ND	1000	ug/Kg	2	01/02/24	SC	SW8082A
PCB-1232	ND	1000	ug/Kg	2	01/02/24	SC	SW8082A
PCB-1242	ND	1000	ug/Kg	2	01/02/24	SC	SW8082A
PCB-1248	ND	1000	ug/Kg	2	01/02/24	SC	SW8082A
PCB-1254	2300	1000	ug/Kg	2	01/02/24	SC	SW8082A
PCB-1260	ND	1000	ug/Kg	2	01/02/24	SC	SW8082A
PCB-1262	ND	1000	ug/Kg	2	01/02/24	SC	SW8082A
PCB-1268	ND	1000	ug/Kg	2	01/02/24	SC	SW8082A
QA/QC Surrogates							
% DCBP	63		%	2	01/02/24	SC	30 - 150 %
% DCBP (Confirmation)	60		%	2	01/02/24	SC	30 - 150 %
% TCMX	50		%	2	01/02/24	SC	30 - 150 %
% TCMX (Confirmation)	51		%	2	01/02/24	SC	30 - 150 %

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-17

Phoenix I.D.: CP76253

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Phyllis Shiller, Laboratory Director
January 03, 2024
Reviewed and Released by: Anil Makol, Project Manager

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

QA/QC Report

January 03, 2024

QA/QC Data

SDG I.D.: GCP76249

QA/QC Batch 712388 (ug/Kg), QC Sample No: CP76249 10X (CP76249, CP76250, CP76251, CP76252, CP76253)

Polychlorinated Biphenyls

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits
PCB-1016	ND	170	87	83	4.7				40 - 140	30
PCB-1221	ND	170							40 - 140	30
PCB-1232	ND	170							40 - 140	30
PCB-1242	ND	170							40 - 140	30
PCB-1248	ND	170							40 - 140	30
PCB-1254	ND	170							40 - 140	30
PCB-1260	ND	170	81	77	5.1				40 - 140	30
PCB-1262	ND	170							40 - 140	30
PCB-1268	ND	170							40 - 140	30
% DCBP (Surrogate Rec)	82	%	87	84	3.5				30 - 150	30
% DCBP (Surrogate Rec) (Confirm	79	%	83	81	2.4				30 - 150	30
% TCMX (Surrogate Rec)	85	%	89	85	4.6				30 - 150	30
% TCMX (Surrogate Rec) (Confirm	81	%	86	83	3.6				30 - 150	30

Comment:

A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

RPD - Relative Percent Difference
LCS - Laboratory Control Sample
LCSD - Laboratory Control Sample Duplicate
MS - Matrix Spike
MS Dup - Matrix Spike Duplicate
NC - No Criteria
Intf - Interference

Phyllis Shiller, Laboratory Director
January 03, 2024

Wednesday, January 03, 2024

Criteria: None

State: NY

Sample Criteria Exceedances Report

GCP76249 - ADELAIDE

SampNo	Acode	Phoenix Analyte	Criteria	Result	RL	Criteria	RL Criteria	Analysis Units
CP76249	$PCB_SOXR	PCB-1268	NY / Requested PCB RL /	ND	28000000	1000	1000	ug/Kg
CP76249	$PCB_SOXR	PCB-1262	NY / Requested PCB RL /	ND	28000000	1000	1000	ug/Kg
CP76249	$PCB_SOXR	PCB-1260	NY / Requested PCB RL /	ND	28000000	1000	1000	ug/Kg
CP76249	$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	78000000	28000000	1000	1000	ug/Kg
CP76249	$PCB_SOXR	PCB-1248	NY / Requested PCB RL /	ND	28000000	1000	1000	ug/Kg
CP76249	$PCB_SOXR	PCB-1242	NY / Requested PCB RL /	ND	28000000	1000	1000	ug/Kg
CP76249	$PCB_SOXR	PCB-1232	NY / Requested PCB RL /	ND	28000000	1000	1000	ug/Kg
CP76249	$PCB_SOXR	PCB-1221	NY / Requested PCB RL /	ND	28000000	1000	1000	ug/Kg
CP76249	$PCB_SOXR	PCB-1016	NY / Requested PCB RL /	ND	28000000	1000	1000	ug/Kg
CP76250	$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	3900	430	1000	1000	ug/Kg
CP76251	$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	5500	710	1000	1000	ug/Kg
CP76252	$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	3300	750	1000	1000	ug/Kg
CP76253	$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	2300	1000	1000	1000	ug/Kg

Phoenix Laboratories does not assume responsibility for the data contained in this exceedance report. It is provided as an additional tool to identify requested criteria exceedences. All efforts are made to ensure the accuracy of the data (obtained from appropriate agencies). A lack of exceedence information does not necessarily suggest conformance to the criteria. It is ultimately the site professional's responsibility to determine appropriate compliance.

Environmental Laboratories, Inc.
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ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Comments

January 03, 2024 SDG I.D.: GCP76249

The following analysis comments are made regarding exceptions to criteria not already noted in the Analysis Report or QA/QC Report: None.

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY Temperature Narration

January 03, 2024

SDG I.D.: GCP76249

The samples in this delivery group were received at 1.1°C.
(Note acceptance criteria for relevant matrices is above freezing up to 6°C)

Cooler: Yes [X] No [ ]
Coolant: IPK [X] ICE [ ] No [ ]

Temp 6.6 °C Pg of

PHOENIX Environmental Laboratories, Inc.

NY/NJ/PA CHAIN OF CUSTODY RECORD

587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040
Email: Makrina Nolan, makrina@phoenixlabs.com Fax (860) 645-0823
Client Services (860) 645-1102

Contact Options:
- [ ] Phone:
- [ ] Fax:
- [ ] Email: adelaidelabresults@adelaidemail.com

Customer: Adelaide Environmental
Address: 1511 Route 22, Suite C24
Brewster, New York 10509

Project: SUNY New Paltz, Dining Hall
Report to:
Invoice to:
QUOTE # :

Project P.O: KSQ:23261.00-IN

This section MUST be completed with Bottle Quantities.

Client Sample - Information - Identification

Sampler's Signature: [signature] Date: 12/28/23

Analysis Request

Matrix Code:
DW=Drinking Water **GW**=Ground Water **SW**=Surface Water **WW**=Waste Water
RW=Raw Water **SE**=Sediment **SL**=Sludge **S**=Soil **SD**=Solid **W**=Wipe
OIL=Oil **B**=Bulk **L**=Liquid

PHOENIX USE ONLY SAMPLE #	Customer Sample Identification	Sample Matrix	Date Sampled	Time Sampled	*MS/MSD (May be billable at analysis unit rate)	PCB	GL Amber 8 oz. [ ] w/H_3PO_4 [ ] $NAHSO_4$	Soil VOA Vials [ ] methanol [ ] H_2O	GL Soil container ( )oz	GL Soil container ( )oz	40 ml VOA Vial [ ] As is [ ] HCl	GL Amber 1000ml [ ] As is [ ] H_2SO_4	PL As is [ ] 250ml [ ] 500ml [ ] 1000ml	PL H_2SO_4 [ ] 250ml [ ] 500ml	PL NAOH 250ml	PL HNO_3 250ml	Bacteria Bottle w/thio	Bacteria Bottle as is
76249	PCB-13	Bulk	12/28/2023			X												
First Floor - North Vestibule Interior Window Glazing - Gray Soft																		
76250	PCB-14	Bulk	12/28/2023			X												
First Floor - North Storefront - Top Layer Caulking - White																		
76251	PCB-15	Bulk	12/28/2023			X												
First Floor - North Storefront - 2nd Layer Caulking - Old Red																		
76252	PCB-16	Bulk	12/28/2023			X												
Exterior - Expansion Joint Caulk																		
76253	PCB-17	Bulk	12/28/2023			X												
Exterior - New Storefront - Caulking - Brown																		

Relinquished by:	Accepted by:	Date:	Time:
[signature]	[signature]	12/28/23	1450
[signature]	[signature] 11:35	12/28/23	805
[signature]	[signature]	12/29/23	1301

Comments, Special Requirements or Regulations:

MS/MSD are considered site samples and will be billed as such in accordance with the prices quoted.

Data Format:
- [ ] Phoenix Std Report
- [ ] Excel
- [ ] PDF
- [ ] GIS/Key
- [ ] EQuIS
- [ ] NJ Hazsite EDD
- [ ] NY EZ EDD (ASP)
- [ ] Other

Turnaround:
- [ ] 1 Day*
- [ ] 2 Days*
- [ ] 3 Days*
- [ ] 4 Days*
- [ ] 5 Days*
- [X] Standard

* SURCHARGE APPLIES

Data Package:
- [ ] NJ Reduced Deliv. *
- [ ] NY Enhanced (ASP B) *
- [ ] Other

NJ
- [ ] Res. Criteria
- [ ] Non-Res. Criteria
- [ ] Impact to GW Soil Cleanup Criteria
- [ ] Impact to GW soil screen Criteria
- [ ] GW Criteria

NY
- [ ] TOGS GW
- [ ] CP-51 SOIL
- [ ] 375SCO Unrestricted Soil
- [ ] 375SCO Residential Soil
- [ ] 375SCO Residential Restricted Soil
- [ ] 375SCO Commercial Soil
- [ ] 375SCO Industrial Soil
- [ ] Subpart 5 DW

PA
- [ ] Clean Fill Limits
- [ ] PA-GW
- [ ] Reg Fill Limits
- [ ] PA Soil Restricted
- [ ] PA Soil non-restricted

State Samples Collected? NY

PHOENIX
Environmental Laboratories, Inc.

Monday, January 08, 2024

Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Project ID: SUNY NEW PALTZ, DINING HALL
SDG ID: GCP74907
Sample ID#s: CP74907 - CP74918

This laboratory is in compliance with the NELAC requirements of procedures used except where indicated.

This report contains results for the parameters tested, under the sampling conditions described on the Chain Of Custody, as received by the laboratory. This report is incomplete unless all pages indicated in the pagination at the bottom of the page are included.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

A scanned version of the COC form accompanies the analytical report and is an exact duplicate of the original.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200. The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Sincerely yours,

Phyllis Shiller
Laboratory Director

NELAC - #NY11301
CT Lab Registration #PH-0618
MA Lab Registration #M-CT007
ME Lab Registration #CT-007
NH Lab Registration #213693-A,B
NJ Lab Registration #CT-003
NY Lab Registration #11301
PA Lab Registration #68-03530
RI Lab Registration #63
VT Lab Registration #VT11301

Environmental Laboratories, Inc.
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Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Sample Id Cross Reference

January 08, 2024

SDG I.D.: GCP74907

Project ID: SUNY NEW PALTZ, DINING HALL

Client Id	Lab Id	Matrix
PCB-S-1	CP74907	SOIL
PCB-S-2	CP74908	SOIL
PCB-S-3	CP74909	SOIL
PCB-S-4	CP74910	SOIL
PCB-S-5	CP74911	SOIL
PCB-S-6	CP74912	SOIL
PCB-S-7	CP74913	SOIL
PCB-S-8	CP74914	SOIL
PCB-S-9	CP74915	SOIL
PCB-10	CP74916	CAULK
PCB-11	CP74917	CAULK
PCB-12	CP74918	CAULK

PHOENIX
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ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

January 08, 2024

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:		12/26/23	
Location Code:	ADELAIDE	Received by:	CP	12/27/23	17:05
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP74907
Phoenix ID: CP74907

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-S-1

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Percent Solid	82		%		12/27/23	ac1	SW846-%Solid
Soil Extraction for PCB	Completed				01/03/24	H/A	SW3546
Polychlorinated Biphenyls							
PCB-1016	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1221	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1232	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1242	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1248	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1254	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1260	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1262	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1268	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
QA/QC Surrogates							
% DCBP	85		%	10	01/04/24	SC	30 - 150 %
% DCBP (Confirmation)	87		%	10	01/04/24	SC	30 - 150 %
% TCMX	89		%	10	01/04/24	SC	30 - 150 %
% TCMX (Confirmation)	88		%	10	01/04/24	SC	30 - 150 %

Project ID: SUNY NEW PALTZ, DINING HALL

Client ID: PCB-S-1

Phoenix I.D.: CP74907

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Phyllis Shiller, Laboratory Director

January 08, 2024

Reviewed and Released by: Anil Makol, Project Manager

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

January 08, 2024

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:		12/26/23	
Location Code:	ADELAIDE	Received by:	CP	12/27/23	17:05
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP74907
Phoenix ID: CP74908

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-S-2

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Percent Solid	83		%		12/27/23	ac1	SW846-%Solid
Soil Extraction for PCB	Completed				01/03/24	H/A	SW3546
Polychlorinated Biphenyls							
PCB-1016	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1221	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1232	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1242	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1248	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1254	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1260	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1262	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1268	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
QA/QC Surrogates							
% DCBP	91		%	10	01/04/24	SC	30 - 150 %
% DCBP (Confirmation)	94		%	10	01/04/24	SC	30 - 150 %
% TCMX	94		%	10	01/04/24	SC	30 - 150 %
% TCMX (Confirmation)	95		%	10	01/04/24	SC	30 - 150 %

Project ID: SUNY NEW PALTZ, DINING HALL

Client ID: PCB-S-2

Phoenix I.D.: CP74908

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Phyllis Shiller, Laboratory Director

January 08, 2024

Reviewed and Released by: Anil Makol, Project Manager

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

January 08, 2024

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:		12/26/23	
Location Code:	ADELAIDE	Received by:	CP	12/27/23	17:05
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP74907
Phoenix ID: CP74909

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-S-3

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Percent Solid	85		%		12/27/23	ac1	SW846-%Solid
Soil Extraction for PCB	Completed				01/03/24	H/A	SW3546
Polychlorinated Biphenyls							
PCB-1016	ND	380	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1221	ND	380	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1232	ND	380	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1242	ND	380	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1248	ND	380	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1254	ND	380	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1260	ND	380	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1262	ND	380	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1268	ND	380	ug/Kg	10	01/04/24	SC	SW8082A
QA/QC Surrogates							
% DCBP	93		%	10	01/04/24	SC	30 - 150 %
% DCBP (Confirmation)	92		%	10	01/04/24	SC	30 - 150 %
% TCMX	94		%	10	01/04/24	SC	30 - 150 %
% TCMX (Confirmation)	95		%	10	01/04/24	SC	30 - 150 %

Project ID: SUNY NEW PALTZ, DINING HALL

Client ID: PCB-S-3

Phoenix I.D.: CP74909

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Phyllis Shiller, Laboratory Director

January 08, 2024

Reviewed and Released by: Anil Makol, Project Manager

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

January 08, 2024

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:		12/26/23	
Location Code:	ADELAIDE	Received by:	CP	12/27/23	17:05
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP74907
Phoenix ID: CP74910

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-S-4

Parameter	Result		RL/ PQL	Units	Dilution	Date/Time	By	Reference
Percent Solid	76			%		12/27/23	ac1	SW846-%Solid
Soil Extraction for PCB	Completed					01/03/24	H/A	SW3546
Polychlorinated Biphenyls								
PCB-1016	ND		430	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1221	ND		430	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1232	ND		430	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1242	ND		430	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1248	ND		430	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1254	3200	*	430	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1260	ND		430	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1262	ND		430	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1268	*	*	430	ug/Kg	10	01/05/24	SC	SW8082A
QA/QC Surrogates								
% DCBP	117			%	10	01/05/24	SC	30 - 150 %
% DCBP (Confirmation)	127			%	10	01/05/24	SC	30 - 150 %
% TCMX	94			%	10	01/05/24	SC	30 - 150 %
% TCMX (Confirmation)	94			%	10	01/05/24	SC	30 - 150 %

Project ID: SUNY NEW PALTZ, DINING HALL

Client ID: PCB-S-4

Phoenix I.D.: CP74910

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

PCB Comment:
* For PCBs, as per section 11.9.3 of SW846 method 8082, when multiple Aroclor's of PCBs are present and the aroclor is no longer recognizable, quantitation may be performed by comparing the total area of the PCB pattern to that of the aroclor it mostly resembles. The PCB pattern did not resemble any of the standards, but most closely resembles a mixture of the Aroclors 1254 and 1268. The PCB is quantitated as a timed group and is reported as the Aroclor 1254.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Phyllis Shiller, Laboratory Director

January 08, 2024

Reviewed and Released by: Anil Makol, Project Manager

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

January 08, 2024

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:		12/26/23	
Location Code:	ADELAIDE	Received by:	CP	12/27/23	17:05
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP74907
Phoenix ID: CP74911

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-S-5

Parameter	Result		RL/ PQL	Units	Dilution	Date/Time	By	Reference
Percent Solid	83			%		12/27/23	ac1	SW846-%Solid
Soil Extraction for PCB	Completed					01/03/24	H/A	SW3546
Polychlorinated Biphenyls								
PCB-1016	ND		390	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1221	ND		390	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1232	ND		390	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1242	ND		390	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1248	ND		390	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1254	1400	*	390	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1260	ND		390	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1262	ND		390	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1268	*	*	390	ug/Kg	10	01/05/24	SC	SW8082A
QA/QC Surrogates								
% DCBP	90			%	10	01/05/24	SC	30 - 150 %
% DCBP (Confirmation)	100			%	10	01/05/24	SC	30 - 150 %
% TCMX	78			%	10	01/05/24	SC	30 - 150 %
% TCMX (Confirmation)	77			%	10	01/05/24	SC	30 - 150 %

Project ID: SUNY NEW PALTZ, DINING HALL

Client ID: PCB-S-5

Phoenix I.D.: CP74911

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

PCB Comment:
* For PCBs, as per section 11.9.3 of SW846 method 8082, when multiple Aroclor's of PCBs are present and the aroclor is no longer recognizable, quantitation may be performed by comparing the total area of the PCB pattern to that of the aroclor it mostly resembles. The PCB pattern did not resemble any of the standards, but most closely resembles a mixture of the Aroclors 1254 and 1268. The PCB is quantitated as a timed group and is reported as the Aroclor 1254.

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Phyllis Shiller, Laboratory Director

January 08, 2024

Reviewed and Released by: Anil Makol, Project Manager

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Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

January 08, 2024

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:		12/26/23	
Location Code:	ADELAIDE	Received by:	CP	12/27/23	17:05
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP74907
Phoenix ID: CP74912

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-S-6

Parameter	Result		RL/ PQL	Units	Dilution	Date/Time	By	Reference
Percent Solid	81			%		12/27/23	ac1	SW846-%Solid
Soil Extraction for PCB	Completed					01/03/24	H/A	SW3546
Polychlorinated Biphenyls								
PCB-1016	ND		410	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1221	ND		410	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1232	ND		410	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1242	ND		410	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1248	ND		410	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1254	1800	*	410	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1260	ND		410	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1262	ND		410	ug/Kg	10	01/05/24	SC	SW8082A
PCB-1268	*	*	410	ug/Kg	10	01/05/24	SC	SW8082A
QA/QC Surrogates								
% DCBP	90			%	10	01/05/24	SC	30 - 150 %
% DCBP (Confirmation)	102			%	10	01/05/24	SC	30 - 150 %
% TCMX	87			%	10	01/05/24	SC	30 - 150 %
% TCMX (Confirmation)	86			%	10	01/05/24	SC	30 - 150 %

Project ID: SUNY NEW PALTZ, DINING HALL

Client ID: PCB-S-6

Phoenix I.D.: CP74912

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

PCB Comment:
* For PCBs, as per section 11.9.3 of SW846 method 8082, when multiple Aroclor's of PCBs are present and the aroclor is no longer recognizable, quantitation may be performed by comparing the total area of the PCB pattern to that of the aroclor it mostly resembles. The PCB pattern did not resemble any of the standards, but most closely resembles a mixture of the Aroclors 1254 and 1268. The PCB is quantitated as a timed group and is reported as the Aroclor 1254.

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Phyllis Shiller, Laboratory Director

January 08, 2024

Reviewed and Released by: Anil Makol, Project Manager

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ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

January 08, 2024

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:		12/26/23	
Location Code:	ADELAIDE	Received by:	CP	12/27/23	17:05
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP74907
Phoenix ID: CP74913

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-S-7

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Percent Solid	83		%		12/27/23	ac1	SW846-%Solid
Soil Extraction for PCB	Completed				01/03/24	H/A	SW3546
Polychlorinated Biphenyls							
PCB-1016	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1221	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1232	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1242	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1248	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1254	1300	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1260	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1262	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1268	ND	400	ug/Kg	10	01/04/24	SC	SW8082A
QA/QC Surrogates							
% DCBP	91		%	10	01/04/24	SC	30 - 150 %
% DCBP (Confirmation)	84		%	10	01/04/24	SC	30 - 150 %
% TCMX	89		%	10	01/04/24	SC	30 - 150 %
% TCMX (Confirmation)	89		%	10	01/04/24	SC	30 - 150 %

Project ID: SUNY NEW PALTZ, DINING HALL

Client ID: PCB-S-7

Phoenix I.D.: CP74913

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

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Phyllis Shiller, Laboratory Director

January 08, 2024

Reviewed and Released by: Anil Makol, Project Manager

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ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

January 08, 2024

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:		12/26/23	
Location Code:	ADELAIDE	Received by:	CP	12/27/23	17:05
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP74907
Phoenix ID: CP74914

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-S-8

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Percent Solid	86		%		12/27/23	ac1	SW846-%Solid
Soil Extraction for PCB	Completed				01/03/24	H/A	SW3546
Polychlorinated Biphenyls							
PCB-1016	ND	390	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1221	ND	390	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1232	ND	390	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1242	ND	390	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1248	ND	390	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1254	ND	390	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1260	ND	390	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1262	ND	390	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1268	ND	390	ug/Kg	10	01/04/24	SC	SW8082A
QA/QC Surrogates							
% DCBP	79		%	10	01/04/24	SC	30 - 150 %
% DCBP (Confirmation)	89		%	10	01/04/24	SC	30 - 150 %
% TCMX	93		%	10	01/04/24	SC	30 - 150 %
% TCMX (Confirmation)	92		%	10	01/04/24	SC	30 - 150 %

Project ID: SUNY NEW PALTZ, DINING HALL

Client ID: PCB-S-8

Phoenix I.D.: CP74914

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

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Phyllis Shiller, Laboratory Director

January 08, 2024

Reviewed and Released by: Anil Makol, Project Manager

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Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

January 08, 2024

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	SOIL	Collected by:		12/26/23	
Location Code:	ADELAIDE	Received by:	CP	12/27/23	17:05
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP74907
Phoenix ID: CP74915

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-S-9

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Percent Solid	87		%		12/27/23	ac1	SW846-%Solid
Soil Extraction for PCB	Completed				01/03/24	H/A	SW3546
Polychlorinated Biphenyls							
PCB-1016	ND	380	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1221	ND	380	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1232	ND	380	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1242	ND	380	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1248	ND	380	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1254	680	380	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1260	ND	380	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1262	ND	380	ug/Kg	10	01/04/24	SC	SW8082A
PCB-1268	ND	380	ug/Kg	10	01/04/24	SC	SW8082A
QA/QC Surrogates							
% DCBP	97		%	10	01/04/24	SC	30 - 150 %
% DCBP (Confirmation)	94		%	10	01/04/24	SC	30 - 150 %
% TCMX	99		%	10	01/04/24	SC	30 - 150 %
% TCMX (Confirmation)	101		%	10	01/04/24	SC	30 - 150 %

Project ID: SUNY NEW PALTZ, DINING HALL

Client ID: PCB-S-9

Phoenix I.D.: CP74915

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

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Phyllis Shiller, Laboratory Director

January 08, 2024

Reviewed and Released by: Anil Makol, Project Manager

PHOENIX
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Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

January 08, 2024

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		12/26/23	
Location Code:	ADELAIDE	Received by:	CP	12/27/23	17:05
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP74907
Phoenix ID: CP74916

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-10

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				12/27/23	J/RB	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	8100000	ug/Kg	10000	12/28/23	SC	SW8082A
PCB-1221	ND	8100000	ug/Kg	10000	12/28/23	SC	SW8082A
PCB-1232	ND	8100000	ug/Kg	10000	12/28/23	SC	SW8082A
PCB-1242	ND	8100000	ug/Kg	10000	12/28/23	SC	SW8082A
PCB-1248	ND	8100000	ug/Kg	10000	12/28/23	SC	SW8082A
PCB-1254	*	*8100000	ug/Kg	10000	12/28/23	SC	SW8082A
PCB-1260	ND	8100000	ug/Kg	10000	12/28/23	SC	SW8082A
PCB-1262	ND	8100000	ug/Kg	10000	12/28/23	SC	SW8082A
PCB-1268	46000000	*8100000	ug/Kg	10000	12/28/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	Diluted Out		%	10000	12/28/23	SC	30 - 150 %
% DCBP (Confirmation)	Diluted Out		%	10000	12/28/23	SC	30 - 150 %
% TCMX	Diluted Out		%	10000	12/28/23	SC	30 - 150 %
% TCMX (Confirmation)	Diluted Out		%	10000	12/28/23	SC	30 - 150 %

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-10

Phoenix I.D.: CP74916

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

PCB Comment:
* For PCBs, as per section 11.9.3 of SW846 method 8082, when multiple Aroclor's of PCBs are present and the aroclor is no longer recognizable, quantitation may be performed by comparing the total area of the PCB pattern to that of the aroclor it mostly resembles. The PCB pattern did not resemble any of the standards, but most closely resembles a mixture of the Aroclors 1254 and 1268. The PCB is quantitated as a timed group and is reported as the Aroclor 1268.

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Phyllis Shiller, Laboratory Director
January 08, 2024
Reviewed and Released by: Anil Makol, Project Manager

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Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

January 08, 2024

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		12/26/23	
Location Code:	ADELAIDE	Received by:	CP	12/27/23	17:05
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP74907
Phoenix ID: CP74917

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-11

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				12/27/23	J/RB	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	610	ug/Kg	1	12/28/23	SC	SW8082A
PCB-1221	ND	610	ug/Kg	1	12/28/23	SC	SW8082A
PCB-1232	ND	610	ug/Kg	1	12/28/23	SC	SW8082A
PCB-1242	ND	610	ug/Kg	1	12/28/23	SC	SW8082A
PCB-1248	ND	610	ug/Kg	1	12/28/23	SC	SW8082A
PCB-1254	2700	610	ug/Kg	1	12/28/23	SC	SW8082A
PCB-1260	ND	610	ug/Kg	1	12/28/23	SC	SW8082A
PCB-1262	ND	610	ug/Kg	1	12/28/23	SC	SW8082A
PCB-1268	ND	610	ug/Kg	1	12/28/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	63		%	1	12/28/23	SC	30 - 150 %
% DCBP (Confirmation)	67		%	1	12/28/23	SC	30 - 150 %
% TCMX	46		%	1	12/28/23	SC	30 - 150 %
% TCMX (Confirmation)	63		%	1	12/28/23	SC	30 - 150 %

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-11

Phoenix I.D.: CP74917

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

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Phyllis Shiller, Laboratory Director
January 08, 2024
Reviewed and Released by: Anil Makol, Project Manager

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Report

January 08, 2024

FOR: Attn: Stephanie Soter
Adelaide Environmental Health Assoc,Inc
1511 Route 22, Suite C24
Brewster, NY 10509

Sample Information		Custody Information		Date	Time
Matrix:	CAULK	Collected by:		12/26/23	
Location Code:	ADELAIDE	Received by:	CP	12/27/23	17:05
Rush Request:	Standard	Analyzed by:	see "By" below		
P.O.#:	KSQ:23261.00-IN				

Laboratory Data

SDG ID: GCP74907
Phoenix ID: CP74918

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-12

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference
Caulk Extraction for PCB	Completed				12/27/23	J/RB	SW3540C
PCB (Soxhlet SW3540C)							
PCB-1016	ND	6300000	ug/Kg	20000	12/28/23	SC	SW8082A
PCB-1221	ND	6300000	ug/Kg	20000	12/28/23	SC	SW8082A
PCB-1232	ND	6300000	ug/Kg	20000	12/28/23	SC	SW8082A
PCB-1242	ND	6300000	ug/Kg	20000	12/28/23	SC	SW8082A
PCB-1248	ND	6300000	ug/Kg	20000	12/28/23	SC	SW8082A
PCB-1254	ND	6300000	ug/Kg	20000	12/28/23	SC	SW8082A
PCB-1260	ND	6300000	ug/Kg	20000	12/28/23	SC	SW8082A
PCB-1262	ND	6300000	ug/Kg	20000	12/28/23	SC	SW8082A
PCB-1268	15000000	6300000	ug/Kg	20000	12/28/23	SC	SW8082A
QA/QC Surrogates							
% DCBP	Diluted Out		%	20000	12/28/23	SC	30 - 150 %
% DCBP (Confirmation)	Diluted Out		%	20000	12/28/23	SC	30 - 150 %
% TCMX	Diluted Out		%	20000	12/28/23	SC	30 - 150 %
% TCMX (Confirmation)	Diluted Out		%	20000	12/28/23	SC	30 - 150 %

Project ID: SUNY NEW PALTZ, DINING HALL
Client ID: PCB-12

Phoenix I.D.: CP74918

Parameter	Result	RL/ PQL	Units	Dilution	Date/Time	By	Reference

RL/PQL=Reporting/Practical Quantitation Level (Equivalent to NELAC LOQ, Limit of Quantitation) ND=Not Detected at RL/PQL
BRL=Below Reporting Level L=Biased Low
QA/QC Surrogates: Surrogates are compounds (preceeded with a %) added by the lab to determine analysis efficiency. Surrogate results(%) listed in the report are not "detected" compounds.

Comments:

Results are reported on an ``as received`` basis, and are not corrected for dry weight.

All soils, solids and sludges are reported on a dry weight basis unless otherwise noted in the sample comments.

If you are the client above and have any questions concerning this testing, please do not hesitate to contact Phoenix Client Services at ext.200.
The contents of this report cannot be discussed with anyone other than the client listed above without their written consent.

Phyllis Shiller, Laboratory Director
January 08, 2024
Reviewed and Released by: Anil Makol, Project Manager

PHOENIX
Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

QA/QC Report

January 08, 2024

QA/QC Data

SDG I.D.: GCP74907

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits
QA/QC Batch 712000 (ug/Kg), QC Sample No: CP72417 10X (CP74916, CP74917, CP74918)										
Polychlorinated Biphenyls										
PCB-1016	ND	170	89	93	4.4				40 - 140	30
PCB-1221	ND	170							40 - 140	30
PCB-1232	ND	170							40 - 140	30
PCB-1242	ND	170							40 - 140	30
PCB-1248	ND	170							40 - 140	30
PCB-1254	ND	170							40 - 140	30
PCB-1260	ND	170	86	87	1.2				40 - 140	30
PCB-1262	ND	170							40 - 140	30
PCB-1268	ND	170							40 - 140	30
% DCBP (Surrogate Rec)	104	%	99	98	1.0				30 - 150	30
% DCBP (Surrogate Rec) (Confirm	97	%	97	93	4.2				30 - 150	30
% TCMX (Surrogate Rec)	92	%	87	94	7.7				30 - 150	30
% TCMX (Surrogate Rec) (Confirm	88	%	90	94	4.3				30 - 150	30

Comment:

A LCS and LCS Duplicate were performed instead of a matrix spike and matrix spike duplicate.

Parameter	Blank	Blk RL	LCS %	LCSD %	LCS RPD	MS %	MSD %	MS RPD	% Rec Limits	% RPD Limits
QA/QC Batch 712713 (ug/Kg), QC Sample No: CP75984 2X (CP74907, CP74908, CP74909, CP74910, CP74911, CP74912, CP74913, CP74914, CP74915)										
Polychlorinated Biphenyls - Soil										
PCB-1016	ND	33	98	98	0.0	138	131	5.2	40 - 140	30
PCB-1221	ND	33							40 - 140	30
PCB-1232	ND	33							40 - 140	30
PCB-1242	ND	33							40 - 140	30
PCB-1248	ND	33							40 - 140	30
PCB-1254	ND	33							40 - 140	30
PCB-1260	ND	33	101	102	1.0	122	115	5.9	40 - 140	30
PCB-1262	ND	33							40 - 140	30
PCB-1268	ND	33							40 - 140	30
% DCBP (Surrogate Rec)	93	%	116	118	1.7	117	116	0.9	30 - 150	30
% DCBP (Surrogate Rec) (Confirm	103	%	122	125	2.4	120	120	0.0	30 - 150	30
% TCMX (Surrogate Rec)	82	%	101	101	0.0	109	108	0.9	30 - 150	30
% TCMX (Surrogate Rec) (Confirm	81	%	101	101	0.0	108	109	0.9	30 - 150	30

If there are any questions regarding this data, please call Phoenix Client Services at extension 200.

RPD - Relative Percent Difference
LCS - Laboratory Control Sample
LCSD - Laboratory Control Sample Duplicate
MS - Matrix Spike
MS Dup - Matrix Spike Duplicate
NC - No Criteria
Intf - Interference

Phyllis Shiller, Laboratory Director
January 08, 2024

Monday, January 08, 2024

Criteria: None

State: NY

Sample Criteria Exceedances Report

GCP74907 - ADELAIDE

SampNo	Acode	Phoenix Analyte	Criteria	Result	RL	Criteria	RL Criteria	Analysis Units
CP74910	$PCB_SMR	PCB-1254	NY / Requested PCB RL /	3200	430	1000	1000	ug/Kg
CP74911	$PCB_SMR	PCB-1254	NY / Requested PCB RL /	1400	390	1000	1000	ug/Kg
CP74912	$PCB_SMR	PCB-1254	NY / Requested PCB RL /	1800	410	1000	1000	ug/Kg
CP74913	$PCB_SMR	PCB-1254	NY / Requested PCB RL /	1300	400	1000	1000	ug/Kg
CP74916	$PCB_SOXR	PCB-1268	NY / Requested PCB RL /	46000000	8100000	1000	1000	ug/Kg
CP74916	$PCB_SOXR	PCB-1016	NY / Requested PCB RL /	ND	8100000	1000	1000	ug/Kg
CP74916	$PCB_SOXR	PCB-1221	NY / Requested PCB RL /	ND	8100000	1000	1000	ug/Kg
CP74916	$PCB_SOXR	PCB-1232	NY / Requested PCB RL /	ND	8100000	1000	1000	ug/Kg
CP74916	$PCB_SOXR	PCB-1242	NY / Requested PCB RL /	ND	8100000	1000	1000	ug/Kg
CP74916	$PCB_SOXR	PCB-1248	NY / Requested PCB RL /	ND	8100000	1000	1000	ug/Kg
CP74916	$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	*	8100000	1000	1000	ug/Kg
CP74916	$PCB_SOXR	PCB-1262	NY / Requested PCB RL /	ND	8100000	1000	1000	ug/Kg
CP74916	$PCB_SOXR	PCB-1260	NY / Requested PCB RL /	ND	8100000	1000	1000	ug/Kg
CP74917	$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	2700	610	1000	1000	ug/Kg
CP74918	$PCB_SOXR	PCB-1268	NY / Requested PCB RL /	15000000	6300000	1000	1000	ug/Kg
CP74918	$PCB_SOXR	PCB-1016	NY / Requested PCB RL /	ND	6300000	1000	1000	ug/Kg
CP74918	$PCB_SOXR	PCB-1221	NY / Requested PCB RL /	ND	6300000	1000	1000	ug/Kg
CP74918	$PCB_SOXR	PCB-1232	NY / Requested PCB RL /	ND	6300000	1000	1000	ug/Kg
CP74918	$PCB_SOXR	PCB-1242	NY / Requested PCB RL /	ND	6300000	1000	1000	ug/Kg
CP74918	$PCB_SOXR	PCB-1248	NY / Requested PCB RL /	ND	6300000	1000	1000	ug/Kg
CP74918	$PCB_SOXR	PCB-1254	NY / Requested PCB RL /	ND	6300000	1000	1000	ug/Kg
CP74918	$PCB_SOXR	PCB-1260	NY / Requested PCB RL /	ND	6300000	1000	1000	ug/Kg
CP74918	$PCB_SOXR	PCB-1262	NY / Requested PCB RL /	ND	6300000	1000	1000	ug/Kg

Phoenix Laboratories does not assume responsibility for the data contained in this exceedance report. It is provided as an additional tool to identify requested criteria exceedences. All efforts are made to ensure the accuracy of the data (obtained from appropriate agencies). A lack of exceedence information does not necessarily suggest conformance to the criteria. It is ultimately the site professional's responsibility to determine appropriate compliance.

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

ACCREDITED IN ACCORDANCE WITH nelac NY # 11301

Analysis Comments

January 08, 2024 SDG I.D.: GCP74907

The following analysis comments are made regarding exceptions to criteria not already noted in the Analysis Report or QA/QC Report: None.

Environmental Laboratories, Inc.
587 East Middle Turnpike, P.O.Box 370, Manchester, CT 06045
Tel. (860) 645-1102 Fax (860) 645-0823

NY Temperature Narration

January 08, 2024

SDG I.D.: GCP74907

The samples in this delivery group were received at 1.5°C.
(Note acceptance criteria for relevant matrices is above freezing up to 6°C)

Cooler: Yes [ ] No [ ]
Coolant: IPK [ ] ICE [ ] No [ ]

Temp 1.5 °C Pg of

PHOENIX Environmental Laboratories, Inc.

NY/NJ/PA CHAIN OF CUSTODY RECORD

587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040
Email: Makrina Nolan, makrina@phoenixlabs.com Fax (860) 645-0823
Client Services (860) 645-1102

Contact Options:
- [ ] Phone:
- [ ] Fax:
- [ ] Email: adelaidelabresults@adelaidemail.com

Customer: Adelaide Environmental
Address: 1511 Route 22, Suite C24
Brewster, New York 10509

Project: SUNY New Paltz, Dining Hall
Report to:
Invoice to:
QUOTE # :

Project P.O: KSQ:23261.00-IN

This section MUST be completed with Bottle Quantities.

Client Sample - Information - Identification

Sampler's Signature: [signature] Date: 12/26/23

Matrix Code:
DW=Drinking Water **GW**=Ground Water **SW**=Surface Water **WW**=Waste Water
RW=Raw Water **SE**=Sediment **SL**=Sludge **S**=Soil **SD**=Solid **W**=Wipe
OIL=Oil **B**=Bulk **L**=Liquid

Analysis Request

PHOENIX USE ONLY SAMPLE #	Customer Sample Identification	Sample Matrix	Date Sampled	Time Sampled	*MS/MSD (May be billable at analysis unit rate)	PCB in Soil	GL Amber 8 oz. [ ] w/H_3PO_4 [ ] $NAHSO_4$	Soil VOA Vials [ ] methanol [ ] H_2O	GL Soil container ( ) oz	GL Soil container ( ) oz	40 ml VOA Vial [ ] As is [ ] HCl	GL Amber 1000ml [ ] As is [ ] H_2SO_4	PL As is [ ] 250ml [ ] 500ml [ ] 1000ml	PL H_2SO_4 [ ] 250ml [ ] 500ml	PL NAOH 250ml	PL HNO_3 250ml	Bacteria Bottle w/thio	Bacteria Bottle as is
74907	PCB-S-1	Bulk	12/26/2023			X												
Exterior - SW Mech Room under Louver - 2" Depth																		
74908	PCB-S-2	Bulk	12/26/2023			X												
Exterior -SW Mech Room under Louver - 2" to 6" Depth																		
74909	PCB-S-3	Bulk	12/26/2023			X												
Exterior - SW Mech Room under Louver - 6" to 12" Depth																		
74910	PCB-S-4	Bulk	12/26/23			X												
Exterior - NW under Louver - 2" Depth																		
74911	PCB-S-5	Bulk	12/26/23			X												
Exterior - NW under Louver - 2" to 6' Depth																		

Relinquished by:	Accepted by:	Date:	Time:
[signature]	[signature]	12/27/23	0600
[signature]	DOMINIC G	12/27	2:10
DOMINIC G	[signature]	12/27/23	1205

Comments, Special Requirements or Regulations:

MS/MSD are considered site samples and will be billed as such in accordance with the prices quoted.

Data Format:
- [ ] Phoenix Std Report
- [ ] Excel
- [ ] PDF
- [ ] GIS/Key
- [ ] EQuIS
- [ ] NJ Hazsite EDD
- [ ] NY EZ EDD (ASP)
- [ ] Other

Turnaround:
- [ ] 1 Day*
- [ ] 2 Days*
- [ ] 3 Days*
- [ ] 4 Days*
- [ ] 5 Days*
- [X] Standard

* SURCHARGE APPLIES

Data Package:
- [ ] NJ Reduced Deliv. *
- [ ] NY Enhanced (ASP B) *
- [ ] Other

NJ
- [ ] Res. Criteria
- [ ] Non-Res. Criteria
- [ ] Impact to GW Soil Cleanup Criteria
- [ ] Impact to GW soil screen Criteria
- [ ] GW Criteria

NY
- [ ] TOGS GW
- [ ] CP-51 SOIL
- [ ] 375SCO Unrestricted Soil
- [ ] 375SCO Residential Soil
- [ ] 375SCO Residential Restricted Soil
- [ ] 375SCO Commercial Soil
- [ ] 375SCO Industrial Soil
- [ ] Subpart 5 DW

PA
- [ ] Clean Fill Limits
- [ ] PA-GW
- [ ] Reg Fill Limits
- [ ] PA Soil Restricted
- [ ] PA Soil non-restricted

State Samples Collected? NY

Cooler: Yes ☑ No ☐
Coolant: IPK ☐ ICE ☑ No ☐

Temp 1.5 °C Pg of

PHOENIX Environmental Laboratories, Inc.

NY/NJ/PA CHAIN OF CUSTODY RECORD

587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040
Email: Makrina Nolan, makrina@phoenixlabs.com Fax (860) 645-0823
Client Services (860) 645-1102

Contact Options:
☐ Phone:
☐ Fax:
☐ Email: adelaidelabresults@adelaidemail.com

Customer: Adelaide Environmental
Address: 1511 Route 22, Suite C24
Brewster, New York 10509

Project: SUNY New Paltz, Dining Hall
Report to:
Invoice to:
QUOTE # :

Project P.O: KSQ:23261.00-IN

This section MUST be completed with Bottle Quantities.

Client Sample - Information - Identification

Sampler's Signature: [signature] Date: 12/26/23

Matrix Code:
DW=Drinking Water **GW**=Ground Water **SW**=Surface Water **WW**=Waste Water
RW=Raw Water **SE**=Sediment **SL**=Sludge **S**=Soil **SD**=Solid **W**=Wipe
OIL=Oil **B**=Bulk **L**=Liquid

Analysis Request

PHOENIX USE ONLY SAMPLE #	Customer Sample Identification	Sample Matrix	Date Sampled	Time Sampled	*MS/MSD (May be billable at analysis unit rate)	PCB IN SOIL
74912	PCB-S-6	Bulk	12/26/2023			X
	Exterior - NW under Louver - 6" to 12" Depth					
74913	PCB-S-7	Bulk	12/26/2023			X
	Exterior - NE Dripline (Plant Bed) - 2" Depth					
74914	PCB-S-8	Bulk	12/26/2023			X
	Exterior - NE Dripline (Plant Bed) - 2" to 6" Depth					
74915	PCB-S-9	Bulk	12/26/2023			X
	Exterior - NE Dripline (Plant Bed) - 6" to 12" Depth					

Columns: GL Amber 8 oz. [ ] w/H_3PO_4 [ ] $NAHSO_4$; Soil VOA Vials [ ] methanol [ ] H_2O; GL Soil container ( )oz; GL Soil container ( )oz; 40 ml VOA Vial [ ] As is [ ] HCl; GL Amber 1000ml [ ] As is [ ] H_2SO_4; PL As is [ ] 250ml [ ] 500ml [ ] 1000ml; PL H_2SO_4 [ ] 250ml [ ] 1500ml; PL NAOH 250ml; PL HNO_3 250ml; Bacteria Bottle w/thio; Bacteria Bottle as is

Relinquished by:	Accepted by:	Date:	Time:
[signature]	[signature]	12/27/23	0600
[signature]	Dominic G	12/27	2:10
Dominic G	[signature]	12/27/23	17:05

Comments, Special Requirements or Regulations:

MS/MSD are considered site samples and will be billed as such in accordance with the prices quoted.

Data Format:
☐ Phoenix Std Report ☐ EQuIS
☐ Excel ☐ NJ Hazsite EDD
☐ PDF ☐ NY EZ EDD (ASP)
☐ GIS/Key ☐ Other

Turnaround:
☐ 1 Day*
☐ 2 Days*
☐ 3 Days*
☐ 4 Days*
☐ 5 Days*
☑ Standard

* SURCHARGE APPLIES

Data Package:
☐ NJ Reduced Deliv. *
☐ NY Enhanced (ASP B) *
☐ Other

NJ
☐ Res. Criteria
☐ Non-Res. Criteria
☐ Impact to GW Soil Cleanup Criteria
☐ Impact to GW soil screen Criteria
☐ GW Criteria

NY
☐ TOGS GW
☐ CP-51 SOIL
☐ 375SCO Unrestricted Soil
☐ 375SCO Residential Soil
☐ 375SCO Residential Restricted Soil
☐ 375SCO Commercial Soil
☐ 375SCO Industrial Soil
☐ Subpart 5 DW

PA
☐ Clean Fill Limits
☐ PA-GW
☐ Reg Fill Limits
☐ PA Soil Restricted
☐ PA Soil non-restricted

State Samples Collected? NY

Cooler: Yes ☐ No ☐
Coolant: IPK ☐ ICE ☐ No ☐
Temp 15 °C Pg of

PHOENIX Environmental Laboratories, Inc.

NY/NJ/PA CHAIN OF CUSTODY RECORD

587 East Middle Turnpike, P.O. Box 370, Manchester, CT 06040
Email: Makrina Nolan, makrina@phoenixlabs.com Fax (860) 645-0823
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Contact Options:
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Customer: Adelaide Environmental
Address: 1511 Route 22, Suite C24
Brewster, New York 10509

Project: SUNY New Paltz, Dining Hall
Report to:
Invoice to:
QUOTE # :

Project P.O: KSQ:23261.00-IN

This section MUST be completed with Bottle Quantities.

Client Sample - Information - Identification

Sampler's Signature: Date: 12/26/23

Matrix Code:
DW=Drinking Water **GW**=Ground Water **SW**=Surface Water **WW**=Waste Water
RW=Raw Water **SE**=Sediment **SL**=Sludge **S**=Soil **SD**=Solid **W**=Wipe
OIL=Oil **B**=Bulk **L**=Liquid

Analysis Request

PHOENIX USE ONLY SAMPLE #	Customer Sample Identification	Sample Matrix	Date Sampled	Time Sampled	*MS/MSD (May be billable at analysis unit rate)	PCB
74916	PCB-10	Bulk	12/26/2023			X
Second Floor - Storage Room - Door Caulk						
74917	PCB-11	Bulk	12/26/2023			X
Second Floor - Office - Interior Hard Window Glazing Compound						
74918	PCB-12	Bulk	12/26/2023			X
Second Floor - Locker Room - Caulk at Terrazzo Floor Basin						

Other analysis columns: GL Amber 8 oz. [ ] w/H_3PO_4 [ ] $NAHSO_4$; Soil VOA Vials [ ] methanol [ ] H_2O; GL Soil container ( )oz; GL Soil container ( )oz; 40 ml VOA Vial [ ] As is [ ] HCl; GL Amber 1000ml [ ] As is [ ] H_2SO_4; PL As is [ ] 250ml [ ] 500ml [ ] 1000ml; PL H_2SO_4 [ ] 250ml [ ] 500ml; PL NAOH 250ml; PL HNO_3 250ml; Bacteria Bottle w/thio; Bacteria Bottle as is

Relinquished by:	Accepted by:	Date:	Time:
		12/27/23	0600
	Dominic	12/27	2:00
Dominic		12/27/23	17:05

Comments, Special Requirements or Regulations:

MS/MSD are considered site samples and will be billed as such in accordance with the prices quoted.

Data Format:
☐ Phoenix Std Report ☐ EQuIS
☐ Excel ☐ NJ Hazsite EDD
☐ PDF ☐ NY EZ EDD (ASP)
☐ GIS/Key ☐ Other

Turnaround:
☐ 1 Day*
☐ 2 Days*
☐ 3 Days*
☐ 4 Days*
☐ 5 Days*
☑ Standard
* SURCHARGE APPLIES

NJ
☐ Res. Criteria
☐ Non-Res. Criteria
☐ Impact to GW Soil Cleanup Criteria
☐ Impact to GW soil screen Criteria
☐ GW Criteria

Data Package:
☐ NJ Reduced Deliv. *
☐ NY Enhanced (ASP B) *
☐ Other

NY
☐ TOGS GW
☐ CP-51 SOIL
☐ 375SCO Unrestricted Soil
☐ 375SCO Residential Soil
☐ 375SCO Residential Restricted Soil
☐ 375SCO Commercial Soil
☐ 375SCO Industrial Soil
☐ Subpart 5 DW

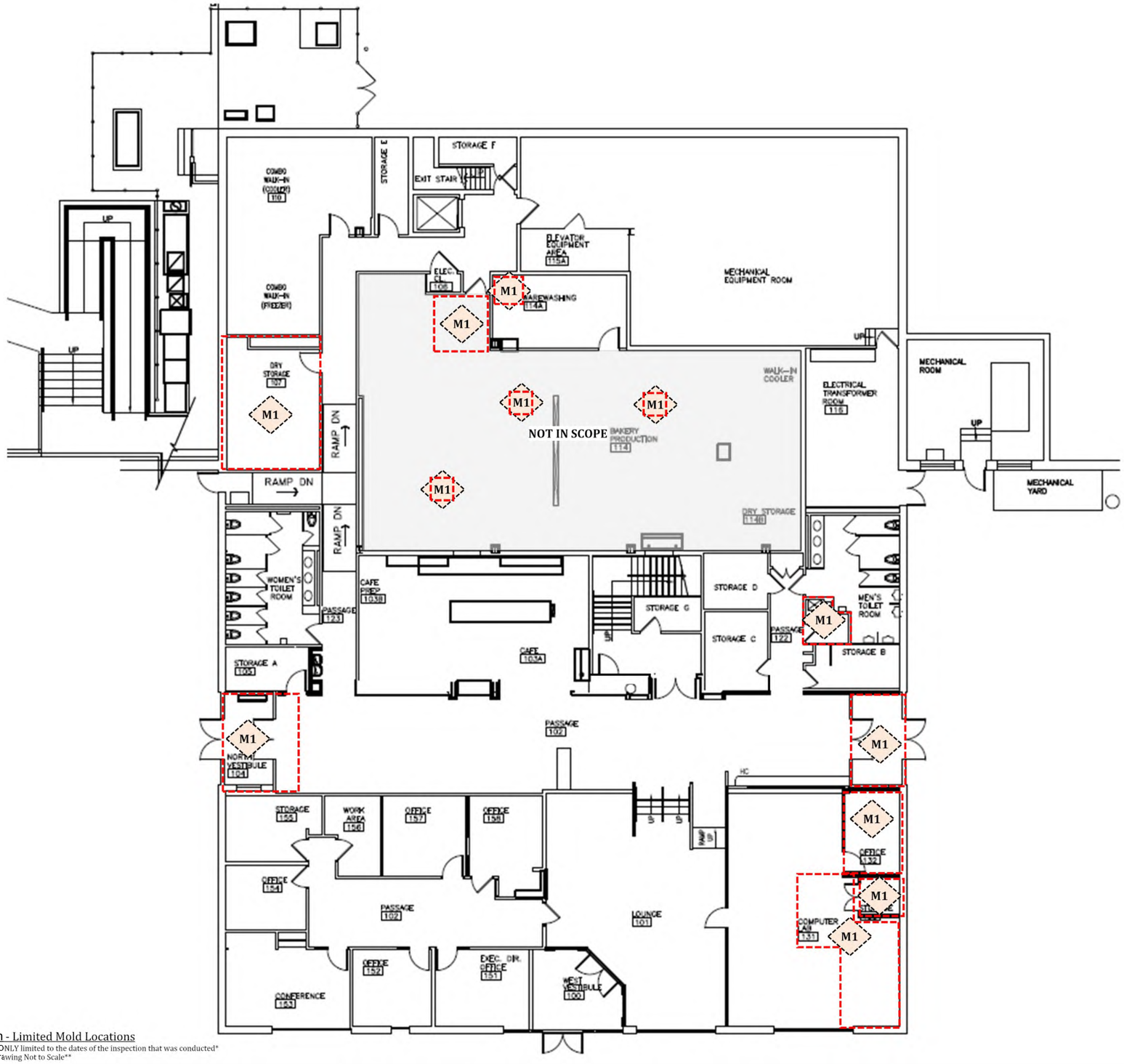
PA
☐ Clean Fill Limits
☐ PA-GW
☐ Reg Fill Limits
☐ PA Soil Restricted
☐ PA Soil non-restricted

State Samples Collected? NY

APPENDIX H

MOLD OBSERVATION MAP(S)

MOLD LEGEND: (see report for details)	
M1	Mold Locations



First Floor Plan - Limited Mold Locations

Mold locations identified on this drawing are ONLY limited to the dates of the inspection that was conducted

Drawing Not to Scale

Adelaide ENVIRONMENTAL HEALTH

1511 Route 22
Brewster, NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

CLIENT:
KSQ Design
215 West 40th Street,
15th Floor
New York, New York 10018

SUNY Project #
081056

SURVEY LOCATION:
SUNY New Paltz
Peregrine Dining Hall
1 Hawk Drive
New Paltz, New York 12561

DATE: 01/12/2023

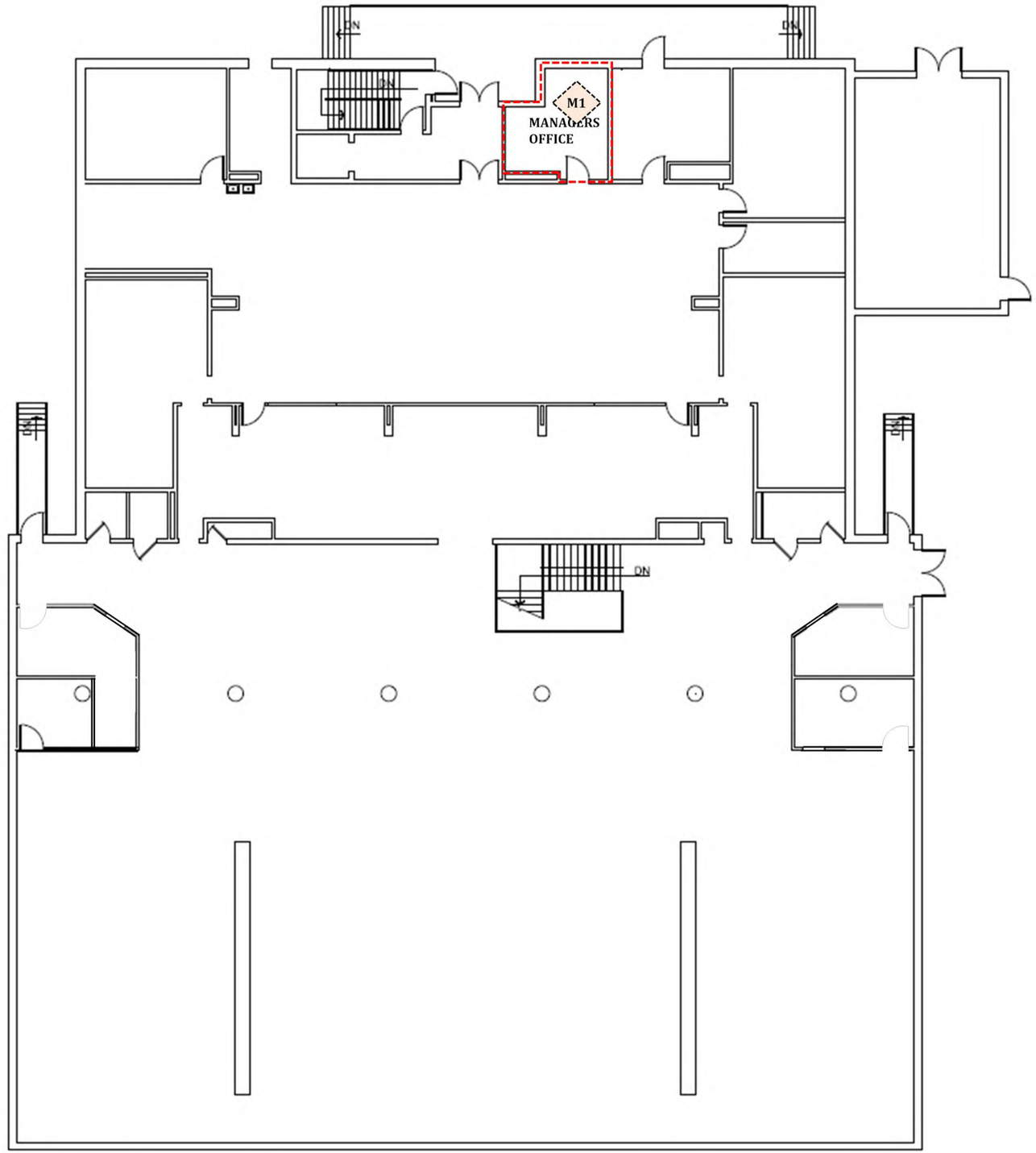
DRAWING VERSION: No. 1

ISSUED FOR:
Renovation HazMat Survey

ADELAIDE PROJECT NO.:
KSQ:23261.00-IN

DRAWING PREPARED BY:
DWS

MOLD-01



Second Floor Plan - Limited Mold Locations

Mold locations identified on this drawing are ONLY limited to the dates of the inspection that was conducted

Drawing Not to Scale

MOLD LEGEND: (see report for details)	
M1	Mold Location

Adelaide ENVIRONMENTAL HEALTH
1511 Route 22
Brewster, NY 10509
Phone: (845) 278-7710
Fax: (845) 278-7750

CLIENT:
KSQ Design
215 West 40th Street,
15th Floor
New York, New York 10018

SUNY Project #
081056

SURVEY LOCATION:
SUNY New Paltz
Peregrine Dining Hall
1 Hawk Drive
New Paltz, New York 12561

DATE: 01/03/2023

DRAWING VERSION: No. 1

ISSUED FOR:
Renovation HazMat Survey

ADELAIDE PROJECT NO.:
KSQ:23261.00-IN

DRAWING PREPARED BY:
DWS

MOLD-02

APPENDIX I

MOLD ANALYTICAL RESULTS

HAYES MICROBIAL CONSULTING

#23051683

Analysis Report prepared for

Adelaide Environmental Health Associates, Inc.

1511 Route 22
Suite #C24
Brewster, NY 10509

Phone: **(845) 278-7710**

KSQ:23261.00-IN
Suny New Paltz
Peregrine Dining Hall
1 Hawk Drive
New Paltz, NY

Collected: **November 24, 2023**
Received: **November 28, 2023**
Reported: **November 28, 2023**

We would like to thank you for trusting Hayes Microbial for your analytical needs!
We received 7 samples by FedEx in good condition for this project on November 28th, 2023.

The results in this analysis pertain only to this job, collected on the stated date, and should not be used in the interpretation of any other job. Information supplied by the customer can affect the validity of results. These results apply only to the samples as received. This report may not be duplicated, except in full, without the written consent of Hayes Microbial Consulting, LLC.

All information provided to Hayes Microbial is confidential information relating to our customers and their clients. We will not disclose, copy, or distribute any information verbally or written, except to those designated by the customer(s). We take confidentiality very seriously. No changes to the distribution list will be made without the express consent of the customer.

This laboratory bears no responsibility for sample collection activities, analytical method limitations, or your use of the test results. Interpretation and use of test results are your responsibility. Any reference to health effects or interpretation of mold levels is strictly the opinion of Hayes Microbial. In no event, shall Hayes Microbial or any of its employees be liable for lost profits or any special, incidental or consequential damages arising out of the use of these test results.

Steve Hayes, BSMT(ASCP)
Laboratory Director
Hayes Microbial Consulting, LLC.

EPA Laboratory ID: VA01419

Lab ID: #188863

DPH License: #PH-0198

David Seddon
Adelaide Environmental Health Associates, Inc.
1511 Route 22 Suite #C24
Brewster, NY 10509
(845) 278-7710

KSQ:23261.00-IN
Suny New Paltz
Peregrine Dining Hall
1 Hawk Drive
New Paltz, NY

#23051683

Spore Trap, Spore Trap Blank
SOP - HMC#101

Sample Number*	1	A1		2	A2		3	A3		4	A4	
Sample Name*	**Computer Room- Inside Area**			**Office- Inside Area**			**Lobby- Outside Area**			**Outside of Building**		
Sample Volume*	75 L			75 L			75 L			75 L		
Reporting Limit	13 spores/m³			13 spores/m³			13 spores/m³			13 spores/m³		
Background	2			2			2			2		
Fragments	ND			ND			ND			ND		
Organism	**Raw Count**	**Count / m³**	**% of Total**	**Raw Count**	**Count / m³**	**% of Total**	**Raw Count**	**Count / m³**	**% of Total**	**Raw Count**	**Count / m³**	**% of Total**
Alternaria												
Ascospores	2	27	16.7%	2	27	66.7%	2	27	100.0%	32	430	66.7%
Aspergillus|Penicillium	10	130	83.3%									
Basidiospores				1	13	33.3%				11	150	22.9%
Bipolaris|Drechslera												
Chaetomium												
Cladosporium										5	67	10.4%
Curvularia												
Epicoccum												
Fusarium												
Memnoniella												
Myxomycetes												
Pithomyces												
Stachybotrys												
Stemphylium												
Torula												
Ulocladium												
Total	12	157	100%	3	40	100%	2	27	100%	48	647	100%

Water Damage Indicator	Common Allergen	Slightly Higher than Baseline	Significantly Higher than Baseline	Ratio Abnormality

* indicates data provided by the customer

Collected: **Nov 24, 2023** Received: **Nov 28, 2023** Reported: **Nov 28, 2023**

HAYES MICROBIAL CONSULTING

Project Analyst: Ramesh Poluri, PhD P. Ramesh Date: **11 - 28 - 2023**

Reviewed By: Steve Hayes, BSMT Stephen N. Hayes Date: **11 - 28 - 2023**

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#23051683

Spore Trap, Spore Trap Blank
SOP - HMC#101

Sample Number*	5	A5	
Sample Name*	**Blank**		
Sample Volume*	0 L		
Reporting Limit	1 spore/m³		
Background	NBD		
Fragments	ND		
Organism	**Raw Count**	**Count / m³**	**% of Total**
Alternaria			
Ascospores			
Aspergillus|Penicillium			
Basidiospores			
Bipolaris|Drechslera			
Chaetomium			
Cladosporium			
Curvularia			
Epicoccum			
Fusarium			
Memnoniella			
Myxomycetes			
Pithomyces			
Stachybotrys			
Stemphylium			
Torula			
Ulocladium			
Total	ND	0	

Water Damage Indicator	Common Allergen	Slightly Higher than Baseline	Significantly Higher than Baseline	Ratio Abnormality

* indicates data provided by the customer

Collected: **Nov 24, 2023** Received: **Nov 28, 2023** Reported: **Nov 28, 2023**

HAYES MICROBIAL CONSULTING

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#23051683

Direct Analysis
SOP - HMC#102

#6	Bio-Tape (1.00 cm2*)	Organism	Spore Estimate	Mycelial Estimate
T1 - Computer Room- Ceiling Tile		Cladosporium	Very Heavy	Many
		Stachybotrys	Heavy	Trace

#7	Bio-Tape (1.00 cm2*)	Organism	Spore Estimate	Mycelial Estimate
T2 - Office- Ceiling Tile		Alternaria	Very Heavy	Many
		Cladosporium	Very Heavy	Many

* indicates data provided by the customer

Collected: **Nov 24, 2023** Received: **Nov 28, 2023** Reported: **Nov 28, 2023**

HAYES MICROBIAL CONSULTING

Project Analyst: Ramesh Poluri, PhD P. Ramesh Date: **11 - 28 - 2023**

Reviewed By: Steve Hayes, BSMT Stephen N. Hayes Date: **11 - 28 - 2023**

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#23051683

Spore Trap Information

Reporting Limit	The Reporting Limit is the lowest number of spores that can be detected based on the total volume of the sample collected and the percentage of the slide that is counted. At Hayes Microbial, 100% of the slide is read so the LOD is based solely on the total volume. Raw spore counts that exceed 500 spores will be estimated.
Blanks	Results have not been corrected for field or laboratory blanks.
Background	The Background is the amount of debris that is present in the sample. This debris consists of skin cells, dirt, dust, pollen, drywall dust and other organic and non-organic matter. As the background density increases, the likelihood of spores, especially small spores such as those of Aspergillus and Penicillium may be obscured. The background is rated on a scale of 1 to 5 and each level is determined as follows: **NBD:** No background detected due to possible pump or cassette malfunction. Recollect sample. (Field Blanks will display NBD) **1 :** <5% of field occluded. No spores will be uncountable. **2 :** 5-25% of field occluded. **3 :** 25-75% of field occluded. **4 :** 75-90% of field occluded. **5 :** >90% of field occluded. Suggested recollection of sample.
Fragments	Fragments are small pieces of fungal mycelium or spores. They are not identifiable as to type and when present in very large numbers, may indicate the presence of mold amplification.
Control Comparisons	There are no national standards for the numbers of fungal spores that may be present in the indoor environment. As a general rule and guideline that is widely accepted in the indoor air quality field, the numbers and types of spores that are present in the indoor environment should not exceed those that are present outdoors at any given time. There will always be some mold spores present in "normal" indoor environments. The purpose of sampling and counting spores is to help determine whether an abnormal condition exists within the indoor environment and if it does, to help pinpoint the area of contamination. Spore counts should not be used as the sole determining factor of mold contamination. There are many factors that can cause anomalies in the comparison of indoor and outdoor samples due to the dynamic nature of both of those environments.
Water Damage Indicator Common Allergen Slightly Higher than Baseline Significantly Higher than Baseline Ratio Abnormality	**Blue:** These molds are commonly seen in conditions of prolonged water intrusion and usually indicate a problem. **Green:** Although all molds are potential allergens, these are the most common allergens that may be found indoors. **Orange:** The spore count is slightly higher than the outside count and may or may not indicate a source of contamination. **Red:** The spore count is significantly higher than the baseline count and probably indicates a source of contamination. **Violet:** The types of spores found indoors should be similar to the ones that were identified in the baseline sample. Significant increases (more than 25%) in the ratio of a particular spore type may indicate the presence of abnormal levels of mold, even if the total number of spores of that type is lower in the indoor environment than it was outdoors.
Color Coding	Fungi that are present in indoor samples at levels lower than 200 per cubic meter are not color coded on the report, unless they are one of the water damage indicators.
Significant Figures	Raw counts and column totals may reflect more than 2 significant figures, but results should only be considered significant to 2 figures.

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#23051683

Direct Analysis Information

Spore Estimate		Percentages
ND	None Detected	0%
Rare	Less than 10 spores	< 1%
Light	10 - 99 spores	1-10%
Moderate	100 - 999 spores	11-25%
Heavy	1000 - 9999 spores	26-50%
Very Heavy	10000 or greater spores	51-100%

Mycelial Estimate	
ND	None Detected No active growth at site.
Trace	Very small amount of Mycelium Probably no active growth at site.
Few	Some Mycelium Possible active growth at site.
Many	Large amount of Mycelium Probable active growth at site.

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#23051683

Organism Descriptions

Alternaria

Habitat: Commonly found outdoors in soil and decaying plants. Indoors, it is commonly found on window sills and other horizontal surfaces.

Effects: A common allergen and has been associated with hypersensitivity pneumonitis. Alternaria is capable of producing toxic metabolites which may be associated with disease in humans or animals. Occasionally an agent of onychomycosis, ulcerated cutaneous infection and chronic sinusitis, principally in the immunocompromised patient.

Ascospores

Habitat: A large group consisting of more than 3000 species of fungi. Common plant pathogens and outdoor numbers become very high following rain. Most of the genera are indistinguishable by spore trap analysis and are combined on the report.

Effects: Health affects are poorly studied, but many are likely to be allergenic.

Aspergillus|Penicillium

Habitat: The most common fungi isolated from the environment. Very common in soil and on decaying plant material. Are able to grow well indoors on a wide variety of substrates.

Effects: This group contains common allergens and many can cause hypersensitivity pneumonitis. They may cause extrinsic asthma, and many are opportunistic pathogens. Many species produce mycotoxins which may be associated with disease in humans and other animals. Toxin production is dependent on the species, the food source, competition with other organisms, and other environmental conditions.

Basidiospores

Habitat: A common group of Fungi that includes the mushrooms and bracket fungi. They are saprophytes and plant pathogens. In wet conditions they can cause structural damage to buildings.

Effects: Common allergens and are also associated with hypersensitivity pneumonitis.

Cladosporium

Habitat: One of the most common genera worldwide. Found in soil and plant debris and on the leaf surfaces of living plants. The outdoor numbers are lower in the winter and often relatively high in the summer, especially in high humidity. The outdoor numbers often spike in the late afternoon and evening. Indoors, it can be found growing on textiles, wood, sheetrock, moist window sills and in HVAC supply ducts.

Effects: A common allergen, producing more than 10 allergenic antigens and a common cause of hypersensitivity pneumonitis.

Stachybotrys

Habitat: Commonly found in soil and on decaying plant material. It is cellulolytic, and can be found indoors on wet materials containing cellulose, such as wallboard, ceiling tile, and other paper-based materials. It is found outdoors on decaying plant material although it is rarely detected on outdoor air samples.

Effects: Allergenic properties are poorly studied and no cases of infection have been reported in humans. They do however produce potent tricothecene mycotoxins. The toxins produced by this fungus can suppress the immune system affecting the lymphoid tissue and the bone marrow. The mycotoxin is also reported to be a liver and kidney carcinogen.

HAYES
MICROBIAL CONSULTING
3005 East Boundary Terrace, #F
Midlothian, VA 23112, USA
804.562.3435 Fax: 804.447.5562

Adelaide Environmental Health Associates, Inc.
1511 Route 22Suite #C24
Brewster, NY 10509
(845) 278-7710
Fax: (845) 278-7750

Chain of Custody

Form v.2101208.1

HMC #

Job Number: KSQ:23261.00-IN

Job Name: SUNY New Paltz
Peregrine Dining Hall
1 Hawk Drive
New Paltz, New York

Collector: David Seddon

Email: adelaidelabresults@adelaidellc.com

Date Collected: 11/24/23

Mobile:

Notes: (SUCF Project 81056)

	Sample #	Sample Name	Analysis Type	Volume	TAT	Notes
AD	A1	Computer Room - Inside Area	S	75L	24h	
	A2	Office - Inside Area	S	↓	↓	
	A3	Lobby - Outside Area	S			
	A4	Outside of Building	S			
	A5	Blank	S	N/A		
BT	T1	Computer Room - Ceiling Tile	D	N/A	24h	
	T2	Office Ceiling Tile	D	↓	↓	

N

SHIP: FEDEX - PAK 50
DATE: 11-28-2023

8177 9550 5517

MOLD

23051683

Analysis Type		Description	TAT	
Spore Trap	S	Identification & Enumeration of Fungal Spores	24 Hour	
	S+	I & E of Fungal Spores + total dander, fiber and pollen count	24 Hour	Spore Trap cassettes, Impact slides
Direct ID	D	ID and Semi-quantative enumeration of spores and mycelium	24 Hour	Tape, Bio-tape, swab, bulk, agar plate for ID only
	D+	ID and Enumeration with spores count	24 Hour	Tape, Bio-tape, swab, bulk, agar plate for ID only
Culture	C1	Identification & Enumeration of Mold only	7 Day	Anderson Air Plate, Swab, Bulk
	C2	Identification & Enumeration of Bacteria only	4 Day	Anderson Air Plate, Swab, Bulk
	C3	Identification & Enumeration of Mold and Bacteria	7 Day	Anderson Air Plate, Swab, Bulk
	C5	Coliform Screen for Sewage Bacteria	2 Day	Anderson Air Plate, Swab, Bulk
Dust Mite	A1	Semi-quantative analysis of dust mite allergen	24 Hour	Bulk Dust
Particle	P	Total Particulate Analysis	24 Hour	Spore Trap cassettes, Impact slides, Bio-Tape

Relinquished by:	Date: 11/27/23	Rcvd By: ADM	Date: 11/28	Time:

APPENDIX J

PERSONNEL AND LABORATORY CERTIFICATIONS

WE ARE YOUR DOL

NEW YORK STATE | Department of Labor

DIVISION OF SAFETY & HEALTH LICENSE AND CERTIFICATE UNIT, STATE OFFICE CAMPUS, BLDG. 12, ALBANY, NY 12226

ASBESTOS HANDLING LICENSE

Adelaide Environmental Health Associates, Inc.
1511 Route 22, Suite C24, Brewster, NY, 10509

License Number: 29305
License Class: RESTRICTED
Date of Issue: 06/07/2023
Expiration Date: 07/31/2024
Duly Authorized Representative: John Soter

This license has been issued in accordance with applicable provisions of Article 30 of the Labor Law of New York State and of the New York State Codes, Rules and Regulations (12 NYCRR Part 56). It is subject to suspension or revocation for a (1) serious violation of state, federal or local laws with regard to the conduct of an asbestos project, or (2) demonstrated lack of responsibility in the conduct of any job involving asbestos or asbestos material.

This license is valid only for the contractor named above and this license or a photocopy must be prominently displayed at the asbestos project worksite. This license verifies that all persons employed by the licensee on an asbestos project in New York State have been issued an Asbestos Certificate, appropriate for the type of work they perform, by the New York State Department of Labor.

Amy Phillips, Director
For the Commissioner of Labor

United States Environmental Protection Agency

This is to certify that

ADELAIDE ENVIRONMENTAL HEALTH ASSOCIATES INC

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires September 08, 2025

LBP-15081-2

Certification #

August 25, 2022

Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

United States Environmental Protection Agency

This is to certify that

Adelaide Environmental Health Associates, Inc

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint renovation, repair, and painting activities pursuant to 40 CFR Part 745.89

In the Jurisdiction of:

All EPA Administered States, Tribes, and Territories

This certification is valid from the date of issuance and expires December 05, 2027

NAT-15081-3

Certification #

August 03, 2022

Issued On

Michelle Price, Chief

Lead, Heavy Metals, and Inorganics Branch

STATE OF NEW YORK - DEPARTMENT OF LABOR
ASBESTOS CERTIFICATE

N.Y.S

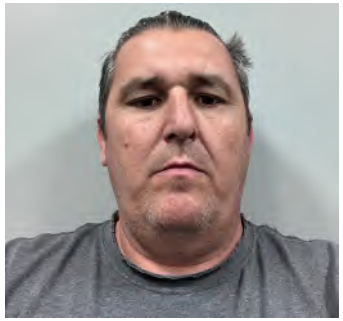
DAVID SEDDON
CLASS(EXPIRES)
C ATEC (12/24) D INSP (12/24)
E MGPL (12/24) H PM (12/24)

CERT# 23-6LJ1V-SHAB
DMV# 879533539

MUST BE CARRIED ON ASBESTOS PROJECTS

United States Environmental Protection Agency

This is to certify that



David W Seddon

has fulfilled the requirements of the Toxic Substances Control Act (TSCA) Section 402, and has received certification to conduct lead-based paint activities pursuant to 40 CFR Part 745.226 as:

Inspector

In the Jurisdiction of:

All EPA Administered Lead-based Paint Activities Program States, Tribes and Territories

This certification is valid from the date of issuance and expires September 19, 2026

LBP-I-101120-3

Certification #

August 14, 2023

Issued On

Ben Conetta, Chief

Chemicals and Multimedia Programs Branch

STATE OF NEW YORK - DEPARTMENT OF LABOR
MOLD ASSESSOR

N.Y.S

DAVID SEDDON

EXPIRES: 01-24

CERT# MA00172

01213 005238608 39

EYES BRN
HAIR BRN
HGT 5' 10"

IF FOUND, RETURN TO:
NYSDOL - L&C UNIT
ROOM 161A BUILDING 12
STATE OFFICE CAMPUS
ALBANY NY 12240

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. KAROL H. LU
AMERICA SCIENCE TEAM NEW YORK, INC
117 EAST 30TH ST
NEW YORK, NY 10016

NY Lab Id No: 11480

is hereby APPROVED as an Environmental Laboratory for the category
ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved subcategories and/or analytes are listed below:

Miscellaneous

Asbestos in Friable Material	Item 198.1 of Manual
	EPA 600/M4/82/020
Asbestos in Non-Friable Material-PLM	Item 198.6 of Manual (NOB by PLM)
Asbestos in Non-Friable Material-TEM	Item 198.4 of Manual

Serial No.: 66402

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/, by phone (518) 485-5570 or by email to elap@health.ny.gov.

NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES SOLID AND HAZARDOUS WASTE
All approved analytes are listed below:

Polychlorinated Biphenyls

Aroclor 1262 (PCB-1262)	EPA 8082A
Aroclor 1262 (PCB-1262) in Oil	EPA 8082A
Aroclor 1268 (PCB-1268)	EPA 8082A
Aroclor 1268 (PCB-1268) in Oil	EPA 8082A
PCB 101	EPA 8082A
PCB 105	EPA 8082A
PCB 118	EPA 8082A
PCB 128	EPA 8082A
PCB 138	EPA 8082A
PCB 153	EPA 8082A
PCB 170	EPA 8082A
PCB 18	EPA 8082A
PCB 180	EPA 8082A
PCB 183	EPA 8082A
PCB 184	EPA 8082A
PCB 187	EPA 8082A
PCB 195	EPA 8082A
PCB 206	EPA 8082A
PCB 209	EPA 8082A
PCB 28	EPA 8082A
PCB 44	EPA 8082A
PCB 49	EPA 8082A
PCB 52	EPA 8082A
PCB 66	EPA 8082A
PCB 8	EPA 8082A
PCB 87	EPA 8082A
PCB Congeners, Total	EPA 8082A

Serial No.: 66336

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NEW YORK STATE DEPARTMENT OF HEALTH
WADSWORTH CENTER

Expires 12:01 AM April 01, 2024
Issued April 01, 2022
Revised March 30, 2023

CERTIFICATE OF APPROVAL FOR LABORATORY SERVICE

Issued in accordance with and pursuant to section 502 Public Health Law of New York State

MS. PHYLLIS SHILLER
PHOENIX ENVIRONMENTAL LABS
587 EAST MIDDLE TURNPIKE
MANCHESTER, CT 06040

NY Lab Id No: 11301

is hereby APPROVED as an Environmental Laboratory in conformance with the National Environmental Laboratory Accreditation Conference Standards (2016) for the category ENVIRONMENTAL ANALYSES AIR AND EMISSIONS
All approved analytes are listed below:

Acrylates

Acrylonitrile	EPA TO-15
Methyl methacrylate	EPA TO-15

Chlorinated Hydrocarbons

1,2,4-Trichlorobenzene	EPA TO-15
Hexachlorobutadiene	EPA TO-15
Hexachloroethane	EPA TO-15

Metals I

Lead, Total	EPA 29 (6010)
	EPA 7010

Polychlorinated Biphenyls

PCBs and Aroclors	EPA TO-10A

Polynuclear Aromatics

Naphthalene	EPA TO-15

Purgeable Aromatics

1,2,4-Trimethylbenzene	EPA TO-15
1,2-Dichlorobenzene	EPA TO-15
1,3,5-Trimethylbenzene	EPA TO-15
1,3-Dichlorobenzene	EPA TO-15
1,4-Dichlorobenzene	EPA TO-15
2-Chlorotoluene	EPA TO-15
Benzene	EPA TO-15
Chlorobenzene	EPA TO-15
Ethyl benzene	EPA TO-15
Isopropylbenzene	EPA TO-15
m/p-Xylenes	EPA TO-15

Serial No.: 66338

Property of the New York State Department of Health. Certificates are valid only at the address shown and must be conspicuously posted by the laboratory. Continued accreditation depends on the laboratory's successful ongoing participation in the Program. Consumers may verify a laboratory's accreditation status online at https://apps.health.ny.gov/pubdoh/applinks/wc/elappublicweb/, by phone (518) 485-5570 or by email to elap@health.ny.gov.

AIHA Laboratory Accreditation Programs, LLC

acknowledges that

Hayes Microbial Consulting

3005 E. Boundary Terrace, Suite F Midlothian, VA 23112

Laboratory ID: LAP-188863

along with all premises from which key activities are performed, as listed above, has fulfilled the requirements of the AIHA Laboratory Accreditation Programs (AIHA LAP), LLC accreditation to the ISO/IEC 17025:2017 international standard, General Requirements for the Competence of Testing and Calibration Laboratories in the following:

LABORATORY ACCREDITATION PROGRAMS

☐	INDUSTRIAL HYGIENE	Accreditation Expires:
☐	ENVIRONMENTAL LEAD	Accreditation Expires:
☑	ENVIRONMENTAL MICROBIOLOGY	Accreditation Expires: February 01, 2025
☐	FOOD	Accreditation Expires:
☐	UNIQUE SCOPES	Accreditation Expires:

Specific Field(s) of Testing (FoT)/Method(s) within each Accreditation Program for which the above named laboratory maintains accreditation is outlined on the attached Scope of Accreditation. Continued accreditation is contingent upon successful on-going compliance with ISO/IEC 17025:2017 and AIHA LAP, LLC requirements. This certificate is not valid without the attached Scope of Accreditation. Please review the AIHA LAP, LLC website (www.aihaaccreditedlabs.org) for the most current Scope.

Cheryl O. Morton

Cheryl O Morton
Managing Director, AIHA Laboratory Accreditation Programs, LLC

Revision20: 06/07/2022

Date Issued: 05/09/2023

SECTION 02 83 13 - LEAD REMEDIATION

Tests results are bound at the end of this section and indicate that paint, soil and/or other existing materials contain lead and a probable leachable lead content of greater than 5ppm.

a. The Contractor shall remove, contain, capture, collect and dispose of the lead containing materials in compliance with all current and pending Federal and State regulations, including the Environmental Protection Agency (EPA), the Resource Conservation and Recovery Act (RCRA), the Hazardous and Solid Waste Amendment (HSWA) the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) and the Occupational Safety and Health Administration (OSHA), and especially 29 CFR 1926 for protection of workers.

b. The Contractor shall bear responsibility for insuring that the waste is properly handled at each stage of operation and properly stored in approved containers. The Campus shall be the generator of the waste, and shall supply its EPA I.D. number and address for use in filling out the manifests. The Contractor shall be responsible for the preparation of the manifest (information and tracking form) to be signed by all applicable parties. The Contractor shall allow two weeks for the Campus to review and sign the completed manifests.

c. The Contractor shall hire an environmental or chemical testing laboratory, accredited by the State of New York, as legally required to sample and test the waste in accordance with EPA method 1311, Toxicity Characteristic Leaching Procedure (TCLP).

d. Waste classified as hazardous shall be shipped off site for treatment, treated on site, or recovered and reused in compliance with Federal and State regulations. Obtain all applicable permits. Provide certification of disposal to the campus.

e. All work areas involving demolition, cutting, modification, etc., to any existing materials shall be considered a lead hazard area per 29 CFR 1926 for the protection of workers unless the contractor removes the potential sources of air borne lead.

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Section 02 84 00 - CAULK REMOVAL

PART 1 - GENERAL

1.1 SUMMARY

A. Test results included within this Division indicate that certain caulk materials contain PCBs at a concentration greater than 50 parts per million and do not contain asbestos. The following shall apply to the removal of PCB non-remediation waste (PCB bulk product waste) being done under this contract:

B. PCB non-remediation waste: Debris generated from construction materials manufactured with PCBs with a concentration greater than 50 ppm. This debris can be the result of building renovation and demolition projects. This debris is also referenced as PCB bulk product waste.

C. Testing: The Fund and Campus reserve the right to employ an independent testing laboratory to perform testing on the work and air sampling. The Contractor shall be required to cooperate with the testing laboratory.

D. When performing any tasks in work areas that contain this product, the contractor is responsible for PPE (Personal Protective Equipment) for all workers, in accordance with all applicable regulations.

E. Size, location, and quantities of all caulk must be field verified. Information given on the drawings and/or specifications is for bidding purposes only.

F. The Contractor shall have at least one English-speaking supervisor on the job site at all times while the project is in progress.

G. The Contractor will be responsible for any damage resulting from improper storage and accidental spills or releases. The supervisor must be able to communicate fluently with all workers and the Owner.

1.2 EXECUTION

A. When working with caulk, work practices shall be performed in a manner that minimizes or prevents airborne dust generation and release to adjacent areas. Aggressive removal techniques, such as power grinding or sanding, shall not be used to remove or dislodge caulk or adjacent materials. The use of hand prying and scraping techniques shall be used to control airborne dust generation. Windows shall be closed and ground covered with plastic from exterior face of building to 10'-0" away from exterior face or furthest point

of gravity fall for material dislodged by removal techniques employed, whichever is further. Debris shall be collected and area shall be wiped down to collect dusts in accordance with all applicable regulations

B. The University requires that all PCB waste products be incinerated at an approved facility and the contractor shall provide a Certificate of Destruction for PCB Waste from the waste incinerator. The University shall be the generator of the waste, and shall supply its EPA I.D. number and address for use in filling out the manifests. The Contractor shall be responsible for the preparation of the manifest (information and tracking form) to be signed by all applicable parties. The Contractor shall allow two weeks for the Campus to review and sign the completed manifests. Submit originals or copies of all pertinent Hazardous Waste Manifests in triplicate to the Fund.

1. Submittals: Prior to commencement of the work on this project, the Contractor must submit the following to the University:

   a. Remediation Plan – General practices and procedures to be followed.
   b. Worker HAZWOPER certifications and proof of medical testing.
   c. Copy of Waste Transporter Permits/License.
   d. Copy of Hazardous Waste Manifest to be used.
   e. Copy of disposal facility license to accept and dispose of PCB waste stream.

2. Prior to the commencement of work involving PCB removal, the Contractor must submit to the University the name of its on-site supervisor responsible for such operations, as well as documentation that the supervisor has completed an OSHA HAZWOPER training course.

1.3. SCOPE OF WORK

A. Removal and disposal of the PCB-containing Caulk, Glazing Compound & Soil. Refer to Drawings AA-100 through AA-103.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 CONTRACT DOCUMENTS

A. **Comply with Contract Documents:** All Work of this Section shall comply with the requirements of the Conditions of the Contract (General, Supplementary and Special), with all Sections of Division 1 - General Requirements, with this Section of the Specifications, with the Drawings and with all other Contract Documents.

B. **Flammable Materials** or materials not conforming in all respects to the fire resistive and fire safety provisions of governing regulations shall not be left in place in the Work.

C. **Disposition of and Exposure to Materials:** Contractor remains fully responsible for the disposition and the exposure to persons of all materials, whether or not hazardous.

D. **Volatile Organic Compounds (VOC):** Contractor remains fully responsible for the supplying of products and materials complying to the VOC limitations set forth by the *Building Code* and by governing agencies having jurisdiction.

1.2 WORK INCLUDED

A. **Scope:** Contractor shall examine all of the Contract Documents for the extent of the Work of this Section of the Specifications, including but not limited to the following:

1. Designing and testing of concrete mixes. Designing of concrete mixes shall be by Contractor's Professional Engineer licensed in the project's jurisdiction.
2. Submission of Shop Drawings, samples, supporting data, mill certificates and the like.
3. Furnishing, fabricating and placing of all reinforcing bars, mesh, field-applied concrete anchors, metal and plastic accessories, spacers and the like.
4. Cooperation in the making of concrete testing samples, in inspecting reinforcing steel and in all other activities related to Work of this Section.
5. Footings, walls, pits and trenches and the like.
6. Porous fill and vapor barrier under slabs on ground.
7. Slabs at ground, bearing, including stairs and equipment bases and the like.
8. Built-up slabs, bearing on fill.
9. Waterstops and keys in construction joints.
10. Groutingfor beam and column base plates.
11. Concrete structure, including beams, columns, walls, slabs and curbs to thickness, depth and width indicated in Structural Drawings.
12. Concrete stairs, steps, landings and platforms, including abrasive finish for exterior treads and platforms.
13. Concrete bases, pedestals, cradles, pads, platforms and the like for mechanical, electrical, elevator and similar equipment.
14. Concrete bases and "housekeeping" pads, and isolation slabs.
15. Concrete fills, where shown in Architectural or Structural Drawings.

16. Grouting, setting and building-in of embedded items provided under other Sections of this Specification.
17. Providing expansion, control and construction joints in concrete Work including the surface preparation and application of bonding compound where specified.
18. Forming and bracing of concrete Work, including both shoring and reshoring of formwork and concrete, and the subsequent removal of formwork, bracing and the like. Design of formwork shall be by Contractor's Professional Engineer licensed in the project's jurisdiction.
19. Cement mortar grouting of openings around below-grade ducts, piping and conduits passing through concrete, and of elevator door sills, plates, anchors and the like.
20. Finishing, curing, and protection of all concrete Work, including both hot and cold weather protection of concrete Work.
21. Hardening and dustproofing of exposed, interior concrete floors, platforms, stairs, landings and the like, including surfaces to receive carpeting and other finishes.
22. Cooperate with Owner, with Construction Manager, with Architect and with Testing Agency in all aspects of quality assurance and in all other activities related to the work of this Section.

B. **Work Installed as Specified Elsewhere:** Contractor shall examine all of the Contract Documents for the extent of Work to be installed under this Section.

1.3 RELATED WORK

A. **Related Work Specified Elsewhere, Amplified Elsewhere or Included in Other Contracts:**

1. Submittals: Section 01 30 00.
2. Owner's plant and field testing and inspection of concrete Work by Testing Agency engaged and paid for by Owner: Section 01 40 00.
3. Site Preparation, Earthwork, Backfilling: Section 02 20 00.
4. Excavation and Retention System: Section 02 30 00.
5. Masonry: Division 4.
6. Structural Steel: Section 05 10 00.
7. Metal Deck and Stud Shear Connectors: Section 05 30 00.

1.4 APPLICABLE CODES AND STANDARDS

A. **General:** Except as modified or voided by requirements specified herein or by details or notes included in the Drawings, Work specified under this Section shall conform to all applicable provisions of the codes, specifications, standards and other reference documents cited in this Specification and/or noted in the Drawings.

B. **Codes:** All Work under this Section shall conform to the requirements of the Building Code of New York State, hereinafter referred to as *Building Code*, and to the regulations of all governmental authorities having jurisdiction.

C. **Reference Documents:** To the extent that the best quality of Work is provided, Work shall conform to the examples, procedures and recommendations listed below, latest edition and revision. Where provisions of the *Building Code*, this Specification, or codes, standards, manuals and specifications cited by this Specification are more restrictive or provide increased quality, the combination of provisions, examples, procedures and recommendations which provide both best quality and *Building Code* conformance shall control the Work.

1. *ACI Detailing Manual*, SP-66 (Includes ACI 315 and ACI 315R). Note that some aspects of SP-66 are out-of-date (bar development lengths, etc.)
2. ACI Concrete Terminology, ACI CT-13.
3. *Chemical Admixtures for Concrete*, ACI 212.3R.
4. *Guide for the Use of High-Range Water-Reducing Admixtures (Superplasticizers) in Concrete*, ACI 212.4R.
5. *Guide for Use of Normal Weight Aggregates in Concrete*, ACI 221R.
6. *Guide for Concrete Floor and Slab Construction*, ACI 302.1R.
7. *Placing Concrete by Pumping Methods*, ACI 304.2R.
8. *Hot Weather Concreting*, ACI 305R.
9. *Cold Weather Concreting*, ACI 306R.
10. *Guide to Formwork for Concrete*, ACI 347R with the specific deletion of reference to tolerances where in conflict with this Specification. Tolerances given in ACI 117 shall apply to the Work except where less stringent than are provided under this Specification.
11. *Manual of Standard Practice*, Concrete Reinforcing Steel Institute.
22. *Qualification of Post-Installed Mechanical Anchors in Concrete*, ACI 355.2.
13. *Qualification of Post-Installed Adhesive Anchors in Concrete*, ACI 355.4.

D. **ASTM (American Society for Testing and Materials) Specifications** cited in ACI 318, ACI 301, this Specification or in cited reference documents shall be the year of adoption or tentative adoption and revision listed in the latest edition of the Annual Book of ASTM Standards, *Index*, except that, should a specific year of adoption or revision be cited by the Contract Documents, by *Building Code*, or be proposed by Contractor and be accepted by Structural Engineer, that edition shall apply to and shall control the Work.

1.5 SUBMITTALS

A. **General**: Submit samples, Shop Drawings, product data, test reports and data, manufacturer's names, certifications, procedures, methodology statements, and the like as stipulated.

1. Review of Contractor's submittals is only for the limited purpose of the examination of submittals for conformance with the design concept of the project and to assist Contractor in ascertaining that the information given in the submittals conforms to the requirements of the Contract Documents.
2. Review of Contractor's submittals is not conducted for the purpose of determining the accuracy or the completeness of the submittal, for dimensions or quantities, or for installation or performance of the system or the piece(s) being submitted.
3. Submittals by Contractor implies that Contractor has checked the submittal with care. Where by error or other cause, Contractor's check has not been accomplished, Contractor shall not rely on review but shall first check and shall then resubmit such material as though the submittal had been rejected.

B. **Shop Drawings:**

1. General: Shop Drawings, as the term is used under this Section, are not Contract Documents, but are intended to demonstrate the way that Contractor intends to conform to the requirements provided in the Contract Documents. Contractor may wish to use these same drawings as a part of the instructions given to craftpersons for the accomplishment of the Work.

2. Best Standards: Shop Drawings furnished under this Section shall conform to the best standards of the construction industry. **Prior to preparation, Contractor shall retain a Professional Engineer, accepted by Construction Manager and by Structural Engineer and licensed in the project's jurisdiction, to satisfy engineering requirements of the Contract Documents and this Specification.**
   a. Shop Drawings shall be prepared under the direction of competent personnel who are experienced with Architectural, Mechanical, Plumbing, Electrical and other building trades Drawings.
   b. Comply with the requirements of ACI SP-66 where more stringent than is specified herein. Show bar schedules; stirrup size and spacing, drawings of bent bars, and size and arrangement of all reinforcement
3. Shop Drawings shall be submitted for review and to governing agencies having jurisdiction for acceptance in accordance with the provisions of the Contract Documents.
4. Shop Drawings shall be submitted in parts as follows:
   a. Sleeve, Insert and Fitting Location Drawings
   b. Construction Joint and Crack Control Joint Location and Detail Drawings
   c. Formwork Drawings
   d. Placing Plans and Elevations
   e. Detail Drawings and Schedules
   f. As required for the work of other trades
   g. Field Work Drawings
5. Sleeve, Insert and Fitting Location Drawings shall show clearly the location and orientation of each item to be placed into the formwork.
6. Construction Joint and Crack Control Joint Drawings shall show the location of joints in beams, slabs, walls, columns and the like, and shall show also the sequence of pours and all else needed for the proper detailing of reinforcing steel.
7. Formwork Drawings shall include plans, elevations, sections and complete details to describe clearly, at an ample scale, all Work to be provided.
   a. **Contractor's Professional Engineer licensed in the project's jurisdiction shall be responsible for the design of formwork. As evidence of conformance with this requirement, each Formwork Drawing shall bear the seal and signature of Contractor's Professional Engineer.**
8. Placing Plans and Elevations shall show, to scale with all dimensions, all concrete Work including top of slabs and depressions, pits, curbs, trenches, pads, equipment bases, steps, slopes, radii, curves, edges of slabs, openings, sleeves, blockouts and the like. Provide schedules and details showing placing sequences, bending, lengths and locations of all reinforcement. Show elevations of all concrete walls with top and bottom elevations, openings, ledges, pockets, construction joints, and all else needed to locate correctly all reinforcement. Detail top and bottom layers of two-way slab reinforcement on separate plans. Identify all epoxy-coated and galvanized reinforcement. Indicate all lap lengths and lap locations in the placing plans.
9. Detail Drawings and Schedules for reinforcing steel, including welded wire fabric (WWF), shall be prepared in strict accord with the methods and procedures provided in ACI SP-66 except that provisions of the Drawings and of this Specification shall prevail. Detail Drawings shall include bar and fabric lists; applicable bar lists shall be submitted simultaneously with related Detail Drawings. Prepare Detail Drawings which provide for reinforcement, including dowels, properly positioned in all concrete Work, so that material can be properly cut, bent and packaged from information given in Detail Drawings.
   a. Reinforcement shall be spliced in strict accord with ACI 318. Where practical, stagger splices of adjacent bars.

b. Unless shown specifically to the contrary, all reinforcement shall be spliced and all splices shall develop the full tensile capacity of the reinforcement. No reduction in splice length or development requirements may be taken because supplied reinforcing is larger than that required under the Contract.
c. Lapped bars may be detailed to be placed in contact and securely wired together or may be separated in accord with ACI 318 to permit embedment of the entire surface of each bar in concrete.
d. Extend slab, beam and girder reinforcement to the far face of supports except where lesser embedment is provided explicitly in the Drawings.

10. Requirements for the Work of Other Trades: Submit detailed drawings showing requirements for the passage of reinforcement through structural steel, precast concrete, masonry and the like.
11. Field Work Drawings: Prepare Field Work Drawings depicting all field work required to accommodate field conditions.
12. **Where Shop Drawings are submitted that include construction loads imposed on the base building structure, these drawings shall clearly show attachment details, locations with respect to project grids, as well as magnitude and direction of loadings for review. There Shop Drawings and supporting load calculations shall bear the seal and signature of Contractor's Professional Engineer licensed in the project's jurisdiction.**
13. Contractor shall coordinate and cross-check for accuracy, completeness and correct relationship to the Work of other Sections, each Shop Drawing prepared for the Work of this Section, including each Shop Drawing prepared by accepted subcontractors. The personally inscribed initials of the person(s) preparing each shop drawing as well as the detailing agency's supervisor and chief checker shall be included in the title block or similarly prominent location.
14. Substitutions: Should Contractor desire a substitution or deviation from the Drawings or Specifications, or both, Contractor shall submit the specific request in writing prior to the submittal of Shop Drawings showing the substitution or deviation. Requests for substitutions or deviations shall be submitted on Contractor's letterhead. Substitutions and deviations not identified, or identified only in letters of transmittal or in Shop Drawings, or both, without the required written description on Contractor's letterhead, may not be accepted and shall be sufficient cause for the rejection and the return of such Shop Drawings without further action.
    a. Acceptance of Shop Drawings including substitutions and deviations not detected during Shop Drawing review, shall not relieve Contractor from responsibility to conform strictly to the Contract Documents. Substitutions and deviations will be allowed only where permitted in writing.
    b. Architect is the sole judge of the suitability of Contractor-proposed substitutions. Review of Contractor-proposed substitutions and deviations is subject to the compensation provisions of Article 1.12.
15. Shop Drawing Review: Only Shop Drawings marked "No Exceptions Taken" or "Make Corrections Noted - Resubmission Not Required" may be used by Contractor in the Work. Shop Drawings marked "Make Corrections Noted - Resubmit" shall be corrected or completed (or both) as required and shall be resubmitted. This process shall be repeated the number of times required to achieve the mark "No Exceptions Taken" or "Make Corrections Noted - Resubmission Not Required". An example of Structural Engineer's Shop Drawing review stamp is shown here for reference.

STRUCTURAL ENGINEER REVIEW

NO EXCEPTIONS TAKEN ☐ RESUBMISSION NOT REQUIRED ☐
MAKE CORRECTIONS NOTED ☐ RESUBMIT ☐
NOT REVIEWED ☐

LERA CONSULTING STRUCTURAL ENGINEERS

BY: _____

DATE: _____

a. Nonconformities and errors detected during review will be noted in Shop Drawings returned to Contractor upon completion of review. Acceptance of Shop Drawings including Substitutions and Deviations not detected during review will not relieve Contractor from sole responsibility to provide Work conforming strictly to the Contract Documents.
b. Review of Contractor's Shop Drawings does not include a review of bills of materials and the like. Accordingly, information required for the review of Shop Drawings shall be contained outside of bills of materials and the like.

16. Resubmission of Shop Drawings: Prior to resubmission of Shop Drawings with additions, deletions, or corrections, Contractor shall cloud and identify all changes from the prior issue. Drawings submitted without each change both clouded and identified clearly will be returned and shall be resubmitted as though the original submittal had been rejected. Each submittal, whether or not accepted or rejected, shall contain a unique revision number, clearly identified.
17. Shop Drawing Log: Contractor shall number Shop Drawings, and revisions to Shop Drawings, in a form acceptable both to Contractor and to Architect/Structural Engineer. Structural Engineer will provide to Contractor in its letters of transmittal both the log-in and the log-out date of each Shop Drawing. Further, on request of Contractor, Structural Engineer will provide to Contractor aged listings of each Shop Drawing remaining in the office of Structural Engineer.

C. **Product Data:** Submit printed manufacturer's literature for each manufactured item specified under Part 2 - Products, along with test data as may be requested.

1. In addition, submit an Environmental Product Declaration (EPD), where available, from the manufacturer for each concrete mix, steel reinforcement, and other products specified. A statement of the Contractor’s good faith effort to obtain the EPD shall be provided if not available.

a. Manufacturer-provided EPD's need be Product Specific Type III (Third-Party Reviewed), in adherence with ISO 14025 Environmental Labels and Declarations, ISO 14044 Environmental Management – Life Cycle Assessment, and ISO 21930 Core Rules for Environmental Product Declarations of Construction Products and Services.

D. **Names of Manufacturers/Suppliers:** Submit for acceptance the names of products along with certification that the products conform in all respects to the requirements of the Contract Documents.

E. **Design Mixes** as provided in Part 2 of this Specification. Submit proposed mix designs for both concrete and grout on the Mix Design Submittal Form included with this specification. Submit test results and other supporting data on each mix design.

F. **Post-Installed Anchor Certificates**: Submit approved independent testing report per ACI 355 (ICC-ES report), Manufacturer's Printed Installation Instructions, letter describing installation procedures, and installer qualifications including certification for horizontal and overhead adhesive installation where applicable.

1.6 MEASUREMENTS AND TOLERANCES

A. **Measurements:**

1. Field Measurements: Obtain all field measurements required for proper fabrication and installation of Work covered by this Section. Submit, prior to installation, all measurements indicating discrepancies from the Drawings. Describe in writing and, where applicable, by sketches proposed methods of correcting discrepancies. Measurements are the responsibility of Contractor.
2. Lay out each part of the Work in strict accordance with the Architectural, Structural, Mechanical, Electrical, Plumbing and all other Drawings and be responsible for correct location of same. Lay out from at least two pre-established benchmarks and axis lines, individually correct for length and bearing.

B. **Allowable Tolerances**: Conform to the requirements listed below and as given in ACI 117, whichever is more stringent; provide more restrictive tolerances where required to meet job conditions and *Building Code*. Tolerances indicated shall apply to the full height of the building. Variations from grade and flatness of Work may be measured prior to removal of supporting formwork or shores and shall be taken as either plus or minus from a true line.

1. Concrete work around elevator shafts, including slabs, beams, columns and walls, shall not fall more than 1/2 inch (13 mm) away from theoretical locations.
2. Variations from Plumb:
   a. lines and surfaces of columns, piers, walls, corners and the like:
      1/4 inch (6 mm) per 10 feet (3 m);
      1 inch (25 mm) per 40 feet (12 m) or more; and
      1 inch (25 mm) maximum for the entire height.
   b. exposed column, control joint grooves, and other conspicuous lines shall correspond at all locations, and shall not exceed:
      1/4 inch (6 mm) per 20 feet (6 m);
      3/8 inch (10 mm) per 30 feet (10 m); and
      1/2 inch (13 mm) per 40 feet (12 m) and larger
3. Level Alignment:
   a. Elevation of top of slab (both slab-on-ground and suspended slabs), 3/4 inch (20 mm).

b. Elevation of formed surfaces before removal of shores, 3/4 inch (20 mm).
c. Lintels, sills, parapets, horizontal grooves and other lines exposed to view, 1/2 inch (13 mm).

4. Relative Alignment:
   a. Stairs
      i) Difference in height between adjacent risers, 1/8 inch (3 mm).
      ii) Difference in width between adjacent treads, 1/4 inch (6 mm).
   b. Unless otherwise noted, formed surfaces may slope with respect to the specified plane at a rate not to exceed:
      i) 1/4 inch (6 mm) in 10 feet (3 m).
      ii) for lintels, sills, parapets, horizontal grooves and other lines and surfaces exposed to view, 1/4 inch (6 mm) in 20 feet (6 m).
5. Building Lines: Variations of the linear building lines from established position in plan and related positions of columns, walls, beams and partitions:
   1/4 inch (6 mm) in 10 feet (3 m);
   3/8 inch (9 mm) in 20 feet (6 m);
   1/2 inch (13 mm) in 40 feet (12 m); and
   1 inch (25 mm) maximum.
6. Faces of formed slab edges, turned down spandrels, and parapets shall not deviate from theoretical position or alignment by more than the distance in consideration divided by 500 or by 1/2 inch (13 mm), whichever is less.
7. Sleeves and Openings: Variations of the sizes and locations of sleeves, floor and wall openings and the like shall not exceed minus 1/4 inch (-6 mm) or plus 1 inch (+25 mm) from size and 1/2 inch (13 mm) from centerline locations given in accepted Shop Drawings.
8. Anchors and Inserts: Variations in the location of anchors and inserts shall not deviate more than 3/8 inch (10 mm) vertically nor 1/4 inch (6 mm) horizontally from positions shown in accepted Shop Drawings.
9. Cross-Sectional Dimensions of columns and beams and the thicknesses of slabs and walls shall not deviate from theoretical by more than the following:
   a. for dimensions of
      12 inches (300 mm) or less ..... +3/8 in.(+10 mm), -0 in.(-0 mm)
   b. for dimensions of more than
      12 inches (300 mm) but not over
      36 inches (900 mm)..... +1/2 in.(+13 mm), -3/8 in.(-10 mm)
   c. for dimensions over
      36 inches (900 mm)..... +1 in.(+25 mm), -3/4 in.(-19 mm)
10. Footings shall vary in plan dimension from theoretical by not more than -0.5 inch (-13 mm) nor more than +2 inches (+50 mm). The center of gravity shall be within 2 percent of the theoretical footing dimension but, in no case, shall deviate from theoretical by more than 2 inches (50 mm). Footings and pile caps shall not be reduced in thickness by more than 5 percent of the specified thickness but, in no case, shall the thickness be less than the theoretical by more than 3 inches (75 mm).
11. Exterior and interior column and wall forms shall be braced during the forming, concrete placement and curing stages so as to produce column and wall straightness and vertical alignment which does not deviate from theoretical position by more than specified tolerances.

C. **Flatness/Levelness Tolerances for Floors:** The flatness/levelness of floors shall conform to the requirements of Table 1.6-1 and will be determined in accordance with ASTM E 1155 (ASTM E 1155 M), *Standard Test Method for Determining Floor Flatness F_F and Floor Levelness F_L Numbers*.

TABLE 1.6-1
MINIMUM ACCEPTABLE VALUES FOR FF AND FL

Location	Steel Trowel Finish	Float Finish Exposed Broom Finish & Garage Floors	Scratch Finish
1. Slabs-on-Ground: a) Specified Overall Value: b) Minimum Local Value:	FF = 35/ FL = 25 FF = 25/ FL = 20	FF = 20/ FL = 15 FF = 15/ FL = 13	FF = 15/ FL = 13 FF = 13/ FL = 10
2. Level Suspended Slabs Shored Until After Testing: a) Specified Overall Value: b) Minimum Local Value:	FF = 25/ FL = 20 FF = 17/ FL = 15	FF = 20/ FL = 15 FF = 15/ FL = 13	FF = 15/ FL = 13 FF = 13/ FL = 10
3. Unshored Suspended Slabs: a) Specified Overall Value: b) Minimum Local Value: c) 80% of the floor shall fall within a ¾" envelope centered on the mean of the data	FF = 25 FF = 17	FF = 20 FF = 15	FF = 15 FF = 13

Where:

i) The Specified Overall Value is the minimum acceptable FF or FL value determined where all measured values of that type on a given Test Surface are combined per ASTM E 1155.

ii) The Minimum Local Value is the minimum acceptable FF or FL value determined for a given Test Section as defined below.

iii) A Test Section shall be bounded by column lines and half column lines, or by construction, control and/or expansion joints, whichever is smaller, but in no case shall a Test Section area be smaller than 320 square feet (30 square meters) or larger than 540 square feet (50 square meters). Test Sections shall also satisfy the criteria set forth in ASTM E 1155.

1.7 TESTING AND INSPECTION

A. **Owner's Testing Agency:** All Work is subject to Special Inspection as required by *Building Code*. Subject to acceptance by Architect, Owner will engage and pay for the services of an independent testing agency (Testing Agency) as outlined in Section 01 40 00, Inspection and Testing. The selected Testing Agency will meet the requirements of ASTM E 329. Contractor alone is responsible for the achieving of the required level of quality, both in the shop and in the field. Testing Agency will rely heavily on reviewed Shop Drawings, as described earlier in this Specification, in its examination of as-constructed Work. Contractor shall not retain Owner's Testing Agency for its own Work but may, subject to acceptance, contract through Owner for such work.

B. **Responsibilities and Duties of Testing Agency:** Testing Agency will perform the following functions, inspections and tests:

1. On instructions and at locations selected by Architect, Testing Agency may sample materials taken from the as-erected Work.
2. Take steps to ascertain that concrete is proportioned and mixed in accordance with the requirements of the Drawings and this Specification.
3. Maintain a presence at the project site during the placing of concrete.
4. Examine formwork for general conformance with the requirements of this Specification.
5. Examine as-placed reinforcing steel for general conformance with the requirements of the Drawings and of this Specification.
6. Receive and review concrete batch/truck tickets at time of delivery and prior to discharging concrete. Review of batch tickets shall include the comparison of actual material and quantities batched to mix design target values.
7. Monitor the methods of conveying concrete from the mixer to the point of placement in the Work.
8. Make, perform and evaluate testing of concrete cylinders in accord with this Specification, with ASTM C 31 and ASTM C 39, and as provided in Section 01 40 00. Capping for concrete cylinders shall be in accordance with either ASTM C 617 (bonded caps) or ASTM C 1231 (unbonded caps).
   a. For each class and strength of concrete take the minimum cylinders indicated below, for each day's work, but not less than for each 100 cubic yards (75 cubic meters) of concrete nor less than for each 4300 square feet (400 square meters) of surface area for slabs or walls. Cylinders shall be tested in the schedule listed below. Where 28 days cylinders fail to conform to the requirements of this Specification, cylinders will be held and tested at 56 days (at 90 days for high strength or mass concrete);

Cylinder Size	Total Cylinders	Cylinder Testing Schedule			
		@7	@28	@56	@90
		days	days	days	days
4" x 8"	7	1	3	3	0
6" x 12"	5	1	2	2	0

   b. Where, after sampling any third portion of a truck load, the elapsed time exceeds 30 minutes, a set of 5 test cylinders will be taken from each third of the load taken at intervals greater than 30 minutes;
   c. Monitor protection systems for test cylinders; and

d. Identify all test cylinders as to placement date and location, concrete mix type and designation number, concrete batch ticket serial number, and other pertinent data.

9. Perform slump tests in accord with ASTM C 143.
   a. Take one test at the beginning of each placement, both at the truck and at the point of discharge, one test at the taking of test cylinders and such other tests as are deemed appropriate by Testing Agency, by Construction Manager, or by Architect.
10. Perform air entrainment tests in accord with ASTM C 231 (ASTM C 173 for concrete with lightweight or high absorption aggregates).
    a. Take one test at the beginning of each placement, one test at the taking of test cylinders and such other tests as are deemed appropriate by Testing Agency, by Construction Manager, or by Architect.
11. Determine the temperature of freshly mixed concrete on a random basis during concrete placement in accord with ASTM C 1064.
12. Perform drying shrinkage tests in accord with ASTM C 157 and with Part 2 of this Specification.
13. For self-consolidating concrete, perform filling, passing, and segregation-resistance workability tests in accord with ACI 237R and ACI 212.3R-16, Chapter 18, “Admixtures for Self-Consolidating Concrete”. Testing personnel shall have been trained and/or had previous experience in the testing of self-consolidating concrete.
    a. For each concrete truck, take one test minimum in accordance with ASTM C1611 including visual stability index and T50 measurements as outlined in Apendix X1 of ACI 237R. Where truck is redosed with HRWR or VMA after the first test, testing shall be repeated.
    b. For the first concrete truck and every 25 cubic yards thereafter, take one test minimum in accordance with ASTM C1621. Where truck is redosed with HRWR or VMA after first test, testing shall be repeated.
    c. For the first concrete truck and every 25 cubic yards thereafter, take one test in accordance with ASTM C1712.
14. Test floor slab finished surface for flatness and levelness in accord with ASTM E 1155 and with this Specification.
    a. The Floor Flatness/Levelness Inspector shall be certified by the Face Companies of Norfolk, Virginia as being competent in F-Number measurement using the Dipstick Floor Profiler. This person shall have tested not less than 250,000 square feet (23,000 square meters) of floor surface using ASTM E 1155 and the F-number system.
    b. Measure slab elevations with a device capable of measuring and recording slab elevation changes of 0.002 inches (50 µm). Use Dipstick by Face Companies, F-meter by Allen Face & Company, or other accepted device.
    c. Where the area of slab surface which falls within 24 inches (600 mm) of construction joints exceeds 25 percent of the slab surface, the entire surface shall be tested, including those areas within 24 inches (600 mm) of construction joints.
    d. Complete testing within 24 hours of placement and before shores are removed, and submit results, including a key plan showing area tested, data sheets and all results required by ASTM E 1155, within 48 hours of placement. Identify clearly all defective areas. Submit to Owner, Architect and Contractor.
15. **All test reports indicating non-compliance shall be emailed immediately to all participants listed on the distribution list and the hard copy shall be sent on different colored paper.**
16. **Not less than monthly, provide a summary report in graphical format of all test data taken for the project separated by class of concrete for the following:**
    a. Compressive strength (also group by age of concrete at time of test);
    b. Slump or spread; and
    c. Water content (both as determined from batch tickets and from microwave tests)

17. Perform Special Inspection of post-installed anchors in accordance with the Building Code, Manufacturer's Printed Installation Instructions, approved independent testing report per ACI 355, Contract Documents and approved shop drawings. As a minimum, provide continuous inspection of adhesive anchors installed in horizontal, or upwardly inclined orientations, supporting tension loads; and periodic inspection of all other conditions of post-installed anchors. Special Inspectors shall be qualified (via experience, training, ACI/CRSI certification, etc.) with the installation and inspection of post-installed anchors. Special Inspections shall include but are not limited to the following:
    a. Verify installer qualifications as required per the Contract Documents;
    b. Verify anchor type, material, size, length, and condition;
    c. Verify minimum concrete age, temperature, strength, and dry condition;
    d. Verify drilling method, hole cleaning, preparation per Manufacturer's Printed Installation Instructions; and
    e. Verify anchor position, setting, and installation method

C. **Authorizations:** Owner's Testing Agency will not be authorized to:

1. Authorize or accept deviations or substitutions from the Contract Documents.
2. Assume any of the responsibilities of Contractor; for example, Testing Agency may not advise formally or informally on any aspect of construction means, methods, techniques, sequences or procedures, or safety precautions and programs in connection with the Work.
3. Accept Shop Drawings or samples.
4. Approve or issue a Certificate of Payment, a Change Order, or issue verbal or written instructions which modify the Contract between Owner and Contractor.

D. **Responsibilities and Duties of Contractor:**

1. Performance or waiving of inspection, testing or surveillance by Testing Agency for a given portion of the Work will not relieve Contractor from responsibility to conform strictly to the requirements of the Contract Documents.
2. Notice: To facilitate and to assist testing and inspection, Contractor shall cooperate by providing proper notice of the initiation of Work. Provide 24 hours minimum notice of each concrete placement or other operation requiring plant or job site testing or inspection.
3. Access to Documents, Facilities and Materials: Furnish one copy of each accepted Shop Drawing and of each mill test certificate to Testing Agency. Provide reasonable office, desk and file space at each location of the Work and at the site to allow Testing Agency to work conveniently with and to maintain project records and drawings. Provide authorized personnel convenient and free access to all parts, locations and areas of Work, including storage areas. Provide hoisting, turning and moving of materials and reasonable quantities of scaffolding, power, casual labor, and other provisions and assistance necessary to allow quality and effective inspection and testing of Work.
4. Provide suitable and adequately sized storage and initial curing facilities for concrete test cylinders. Conform fully to the requirements of ASTM C 31. Provide all necessary job site facilities required to allow and assist Testing Agency to perform its tests and inspections in full conformance to all applicable standards, codes, and provisions of this Specification.
5. Secure and deliver to Contractor's independent testing laboratory without additional cost to Owner, representative samples of each material or ingredient required to be tested and certified prior to submittal for acceptance.
6. Reimburse Owner for the actual cost of all tests performed exclusively for the Contractor's convenience (such as job cured cylinders for early stripping of formwork) and for all tests and retests made necessary by initial nonconformance to Contract Documents.

7. Cost of Owner's Tests by Testing Agency will be borne by Owner. However, where additional tests are deemed necessary by Construction Manager or by Architect on account of failure to pass tests, the cost of additional testing will be deducted from payments to Contractor so as to reduce the Contract price.

1.8 QUALITY ASSURANCE

A. **Source Quality Control:** Contractor's material control procedures shall be effective and shall assure that all Work fulfills the requirements of the project as well as the applicable provisions of the Contract Documents. All materials shall be tested in accord with the requirements of *Building Code*, of Building Department, of governing authorities having jurisdiction and of this Specification.

B. **Shop and Construction Site Quality Control:** Contractor shall maintain, on staff, sufficient office, field engineering, and field supervision staff to assure that all data and layout drawings for Work of other Sections is transmitted to detailers to allow proper detailing of holes, penetrations, chases, and the like and to assure proper execution of the Work in the field.

C. **Concrete Strength:** Evaluation and acceptance of concrete strength shall conform to the requirements of ACI 318. Where laboratory cured cylinder test results do not satisfy these requirements, Contractor shall make sufficient and appropriate changes to concrete proportions for the remaining Work in order to assure acceptable strength test results. Where required, Contractor shall provide also reshoring and additional curing of concrete slow in attaining design strength. Additionally, at its sole discretion, Construction Manager or Architect may permit or require core tests in accord with ASTM C 42. Load tests shall not be performed without Construction Manager's or Architect's specific concurrence, and then only after acceptance of comprehensive, detailed procedures prepared by, signed and sealed by Contractor's Professional Engineer, and submitted in writing.

1. Core tests may be required of Contractor where:
   a. the average of one or more sets of three consecutive strength tests falls below f'c;
   b. one or more individual strength tests falls below f'c by more than 500 psi (3500 kPa);
   c. strength tests of field-cured cylinders, accomplished at the designated age, fall more than 15 percent below strength tests of companion laboratory-cured cylinders;
   d. samples of concrete for acceptance test cylinders are not representative of concrete in place in the structure.
2. Perform all tests, and all corrective and restorative measures at no expense to Owner. Construction Manager and Architect shall be sole interpreter of the need for additional tests, and Construction Manager's and Architect's judgment shall be binding on Owner and Contractor alike.
3. Laboratory cured cylinders shall not be used for evaluating either compressive strength or acceptable condition of concrete suspected of being frozen, or for determining strength of concrete for early stripping of formwork.
4. Should core specimens be taken, Contractor shall plug all core holes solid with matching concrete or non-shrink grout as directed. All such plugging shall be Contractor's responsibility and shall be performed at no expense to Owner. All such work shall be subject to acceptance and to correction by Contractor, where not in conformance with the Contract Documents.

D. **Qualifications:** Contractor shall determine, shall warrant and shall certify that producers, epoxy coating applicator, reinforcing steel detailer, fabricator and installer, formwork constructor, concrete placer, finisher and all others involved in the Work, along with their personnel, are experienced, qualified and adequately staffed to undertake the specific Work required under this Section.

E. **Post-Installed Anchors** shall be installed by workers with experience and training with installing the specified anchors. Installation of adhesive anchors in horizontal or upwardly inclined orientations supporting tension load shall be performed by installers certified through the ACI/CRSI adhesive anchor installer certification program, or approved equivalent.

1.9 PRODUCT DELIVERY, STORAGE AND HANDLING

A. **Original Containers:** Materials shall be delivered to the site, ready for use, in the manufacturer's original and unopened containers and packaging, bearing original labels as to type of material, brand name, and manufacturer's name. Delivered materials shall be identical to accepted samples.

B. **Storage:** Materials shall be stored under cover in dry, weathertight, adequately ventilated and clean locations off the ground. Storage methods shall also provide for free and rapid drainage of rainwater and shall prevent collection of water on or within stored materials. Post-installed anchors shall be stored in accordance with manufacturer’s requirements.

C. **Protect** reinforcing steel and mesh from scaling, oil, grease and distortion. Reinforcing steel and mesh that has rusted to the extent of scaling will be rejected and may be placed in the Work only after proper cleaning, and shall be subject to acceptance.

D. **Aggregates** to be used in field mixed concrete or grout shall be stockpiled in separate bins or piles in a manner suitable to minimize segregation and contamination of aggregates. Field mixing is not encouraged and will be allowed only with specific written permission.

E. **Batch/Truck Tickets:** Provide a copy of each batch ticket for each batch of concrete discharged and used in work. Batch tickets shall be submitted to Owner or Owner's inspection agency prior to discharging concrete. Contractor shall retain duplicate tickets until such time as Owner has received a Certificate of Occupancy. Tickets need indicate the following:

1. Ready-mix batch plant name and location.
2. Project identification number, name and location.
3. Serial number of ticket.
4. Truck number.
5. Mix type and designation number.
6. Date and time of first mixing of cement and aggregates.
7. Actual material and quantities batched, both at plant and site, including total free water and admixtures. Total free water includes free water on the aggregates, water in each admixture, water and ice.
8. Amount of concrete batched.
9. Signature of plant quality control supervisor and, if water and/or admixtures are added at the site, site quality control supervisor.

1.10 JOB CONDITIONS

A. **Contractor's Responsibility:** Contractor shall be solely responsible for the correctness of dimensions and quantities and for the fitting to other Work; for Work to be confirmed and correlated at the site; for information pertaining to the fabrication procedure or to the means, methods, techniques, sequences and procedures of construction; and for the coordination of the Work of this Section with the Work of all other trades.

B. **Contractor's Coordination:** Contractor shall coordinate and schedule the Work of this Section with the Work of other Sections of this Specification in order to optimize quality and to avoid delay in overall job progress.

C. **Rejection of Work:** Testing Agency may inspect and test materials at the source before shipment as well as at the site before, during or after installation in the Work. Construction Manager and Architect reserve the right, at any time before final acceptance of the completed Work, to reject material not conforming with specified requirements, regardless of previous tests, inspections, acceptances, or inclusion in certificates of payment.

D. **Construction Sequence**: Descriptions of limitations on construction sequence are intended to assist Contractor in coordinating the Work of the Project. Descriptions do not describe fully the limitations given, do not describe all limitations, nor do they preclude construction sequences not contemplated herein. **Whether or not Contractor follows the limitations on construction sequence described herein, and until such time as the structural Work is completed, Contractor remains fully responsible for both the stability and the safety of the Work; adherence to the limitations described herein does not relieve Contractor from that responsibility.**

1.11 DEFICIENT WORK

A. **Repairing, Patching, Cleaning:** Contractor shall correct all Deficiencies in the Work of this Specification including areas where Testing Agency reports, or Construction Manager's or Architect's rejections have indicated that Work is not in full compliance with the Contract Documents. Perform, at no expense to Owner, all additional tests that Construction Manager or Architect deems necessary to reconfirm noncompliance of the original Work and perform, at no expense to Owner, all tests and inspections which may be necessary to show compliance of corrected Work.

B. **Defective and Nonconforming Work:** Defective Work, unsuitable Work, or Work otherwise failing to conform to the Contract Documents shall be made good by Contractor at no change in the amount of or the time of the Contract. Contractor shall prepare appropriate details and procedures for bringing such Work into conformance with the Contract Documents and shall submit such details and procedures for acceptance. Corrective Work, including materials, shall conform strictly to accepted details and procedures. Nonconforming Work may be rejected at any time, regardless of prior acceptance in Shop Drawings, prior inspection, inclusion in inspection or test reports, or inclusion in certificates of payment.

C. **Deficiencies**: Where Work exhibits any one or more of the following deficiencies, or where Work otherwise fails to conform to the requirements of the Contract Documents or to the requirements of *Building Code*, for any reason or combination of reasons, such Work shall be considered Deficient and not in conformance with the requirements of the Contract:

1. Low cylinder strength at 28 days, as defined by this Specification.
2. Excessive or deficient water, air, cement, admixture, or any other material.
3. Slump and slump-flow not in accord with this Specification.
4. Unauthorized addition of water.
5. Spalling, honeycombing or the like.
6. Unauthorized cutting, chopping, construction joints, cold joints and so forth.
7. Workmanship not in accord with the Drawings, with this Specification, with accepted samples, or with referenced codes or standards.
8. Cracking, surface defects, or improper consolidation.

9. Exceedance of tolerances, lack of alignment, and incorrect forming.
10. Floor flatness/levelness F-numbers (either FF, FL or both) which measure less than specified minimum values.
11. Evidence of freezing, improper curing and the like.
12. Contact with aluminum or with aluminum alloys except where specifically permitted under this Specification.
13. Post-installed anchors not set in accordance with Manufacturer's Printed Installation Instructions, adhesive anchors not set with insufficient adhesive (no overfill visible).
14. Use of non-conforming materials or systems.

D. **Replacement or Repair:** Where Construction Manager or Architect, at its sole discretion, finds any of the above deficiencies or other Work not in accord with the requirements of the Contract Documents, Construction Manager or Architect may order that the affected Work be replaced or repaired at Contractor's expense.

1. Contractor shall reimburse Owner for the actual amount of the fees of Testing Agency for the reinspection and the retesting of Work deemed defective by Construction Manager or by Architect.

E. **Cost:** The cost of all other activities and procedures associated with defective Work shall be paid by Contractor.

PART 2 - PRODUCTS

2.1 CONCRETE MIXTURES

A. **Contractor Furnished Mix Designs:** For each type and strength of concrete mixture and grout mixture required in the Work, Contractor shall submit for Architect's acceptance a mix design. **Each mix design shall conform to the applicable provisions of this Specification and *Building Code*. Mix designs shall be established by Contractor's Professional Engineer licensed in the project's jurisdiction on the basis of field experience and or trial mixes prepared by Contractor and both monitored and tested by an independent testing laboratory retained and paid by Contractor. Mix designs in current use, documented by current test reports, may be submitted for acceptance in accord with ACI 301. All mix designs shall be submitted on the Mix Design Submittal Form included in this specification.** This form is available electronically for Contractor's use.

1. Contractor shall be fully responsible for conformance to all mix design and control provisions of this Specification and for the strength, consistency, and handling of concrete. Concrete supplier, and admixture manufacturer(s) shall state and certify that the proposed concrete mixes and placing procedures will produce the strengths, finishes, densities and like qualities required by this Specification.
2. Mix designs may be adjusted by Contractor to suit minor variability of materials, job conditions, weather, test results and other data, subject to acceptance and provided there is no change in the amount of the Contract; laboratory data for revised mix designs shall be submitted and accepted prior to use in the Work.
3. Contractor shall pay all costs associated with preparing, testing, documenting and submitting design mixes for each concrete mix design used in the Work.
4. Contractor shall provide notification of the time and location where each trial mix will be prepared and/or tested.

B. **Concrete Mix Requirements:** Proportions for each mix shall provide for homogeneous, cohesive, workable and dense concrete, suitable in all respects for its intended purpose. Concrete mixes shall be selected to provide for requirements not less than those required by Table 2.1-1. All concrete shall have a maximum shrinkage of 0.04% at 28 days when tested in accordance with ASTM C157, 7-day moist cure. Where lower shrinkage is required, it shall be so noted in the Contract Documents. See Article 2.1.G.

TABLE 2.1-1

Nominal Strength f'c @ 28 days psi (MPa) Note 1	Type of Concrete	Minimum Cementitious Content Lbs. Per CY (Kg per CM) Note 2	Maximum Water-Cementitious Material Ratio Note 3
Structural Concrete			
6000 (41)	normal weight	665 (395)	0.40
4000 (28)	normal weight	540 (320)	0.50
4000 (28)	lightweight	560 (356)	Note 4
2000 (14)	lean concrete	300 (178)	Note 4
Slab Concrete			
4000 (28)	nw, slab on ground, built-up (interior)	575 (340)	0.50

TABLE 2.1-1 Con't

Note 1: f'c in accord with ACI 318.
Note 2: Minimum cementitious means total weight of cementitious material as permitted by this Specification (cement, slag, fly ash, and silica fume).
Note 3: Maximum water-cementitious material ratio will be reviewed for conformance to ACI 318. Field documented mix designs shall be responsive to this requirement.

Note 4: Maximum water content, minimum cement content and maximum allowable slump shall be those reported in the accepted mix design.

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1. Each mix shall be proportioned to fulfill the water-cementitious material ratio at the maximum permitted slump. Self-consolidating concrete mixes shall be proportioned to fulfill the required workability criteria range and the water-cementitious material ratio and shall be established on the basis of full scale testing at the plant or site as well as trial mixes and mock-ups. In designing the mix, the size and the form of the structure, the dimension and density of reinforcement and cover should be taken in consideration.
2. Contractor may use fly ash or other pozzolans to replace not more than 30% by weight, pound for pound, of required cement. Contractor may use slag to replace not more than 40% by weight, pound for pound, of required cement. Fly ash or slag may not be used to substitute for cement conforming to ASTM C 595, (i.e., for pozzolan modified cement). Silica fume may be used to replace not more than 10% by weight, pound for pound of required cement. Review mix proportions with pozzolan manufacturer's representative prior to batching and testing trial mixes. The total amount of fly ash and other pozzolans, slag, and silica fume shall not exceed the limits of ACI 318 for concrete exposed to deicing chemicals.
3. Use admixtures as required by this Specification and as recommended by admixture manufacturer for the specific climatic conditions at the time of placement.
4. Slump of less than 3 inch (75 mm) at point of discharge will not be permitted except where allowed specifically in this Specification.
5. Exterior concrete trial mixes shall be tested for rapid chloride permeability in accordance with ASTM C 1202. Rapid chloride permeability test results will be used in evaluating the acceptability of proposed mix proportions and, except where requested by Architect or Construction Manager need not be determined for production concrete. Contractor shall prepare two, 4 inch (100 mm) diameter by 8 inch (200 mm) long, cylinders for each mix design to be tested. These cylinders shall be water cured for 28 days, air cured until an age of 56 days, and tested in accordance with ASTM C 1202.
   Acceptable mixes shall provide the following test results:
   a. 1,000 coulombs or less for reinforced concrete exposed to weather and deicing chemicals.
   b. 2,500 coulombs of less for concrete exposed to ambient temperature.
   c. 3,500 coulombs or less for concrete substructures.
   d. Testing is not required for interior concrete.
6. For exterior concrete, the total maximum water soluble chloride ion concentration in hardened concrete at an age from 28 to 42 days shall not exceed the limits of ACI 318 when tested in accordance with ASTM C 1218. If the total maximum water soluble chloride ion content, calculated on the basis of individual concrete ingredients, exceeds the limits of ACI 318, samples of the hardened concrete shall be tested in accordance with ASTM C 1218.

C. **Air-Entrainment:** Concrete shall be air-entrained in accord with Table 2.1-2 except that entrained air is not required for concrete for footings and interior slabs on ground to receive steel troweled finish where such concrete will not be subject to freeze/thaw. Lightweight concrete shall be air-entrained in accordance with Table 2.1-2 except that the entrained air shall be no less than 4% and no greater than 7% to meet U.L. fire resistance rating requirements.

TABLE 2.1-2

TOTAL AIR CONTENT*

Maximum Aggregate Size No.**	**Maximum Nominal Size**	**Required Air Content (Percent)**
# 467	1-1/2 (38 mm)	4.5 ± 1.5
# 57	1 (25 mm)	5.0 ± 1.5
# 67	3/4 (19 mm)	6.0 ± 1.5
# 7	1/2 (13 mm)	7.0 ± 1.5
# 8	3/8 (10 mm)	8.0 ± 2.0

* Interior slabs on ground, to receive steel troweled finish, shall have an air content not to exceed 2.0% ± 1%. No air entraining admixture permitted.

** Size designations per ASTM C 33 or C 330.

D. **Slump and Slump-Flow:** Concrete that is not self-consolidating shall be proportioned and produced to provide slump, at the point of delivery into the work, as tabulated in Table 2.1-3. A tolerance of not more than 1 inch (25 mm) additional will be allowed for one batch within each five consecutive batches of each mix design.

TABLE 2.1-3

Type of Concrete	**Maximum Slump** inches *
Normal Weight	4 (100 mm)
Lightweight	4 (100 mm)
Slab on Ground	4 (100 mm)
Pumped	Note 1
Ramps and Sloping Surfaces	3 (75 mm)

* Increased slump may only be achieved by the used of the specified HRWR admixture.

Note 1: All pumped concrete shall contain the specified HRWR admixture. Slump loss shall not be more than 2” from the pump to the point of deposit.

1. Self-Consolidating Concrete Slump-Flow and Workability: Self-consolidating concrete shall be proportioned and produced to provide a slump flow from 22 inches (560 mm) to 30 inches (760 mm). Actual slump-flow and other workability test criteria shall be determined based on the requirements of the particular self-consolidating concrete application using trial mixes and full-scale test placements on site in accordance with ACI 237R, Self-Consolidating Concrete and other applicable standards.

E. **Water-Reducing Admixture** shall be incorporated into all concrete (not required for mixes designed for superplasticized and self- consolidating concrete) at a minimum dosage of 3.5 fluid ounces per CWT (230 cm^3/100 kg) of cement, in strict conformance with manufacturer's directions. Contractor shall consult with admixture manufacturer and shall propose increased dosage rates as appropriate to achieve optimum workability, cohesiveness and uniformity of concrete mixtures as placed in the Work.

1. Use non-corrosive, accelerating admixture in concrete slabs and in other thin concrete work where concrete is placed at ambient temperatures below 50°F (10°C).

F. **Superplasticized (HRWR) Concrete**: Use in all pumped concrete and concrete with a water/cementitious ratio below 0.50 and in all locations where required to meet the requirements of the contract documents. Prepare with a high-range, water-reducing admixture (HRWR). Contractor's mix design shall also include written descriptions of Contractor's methods for mixing, placing and conveying concrete and shall also include design procedures to be used for the formwork.

1. HRWR mixes may be prepared to provide concrete with 9-inch (225 mm) maximum slump and intended slump of 8.0 +1 inch (200±25 mm) in lieu of the slump maximums specified herein, while adhering to the water-cementitious material ratio maximums specified. Alternatively, HRWR admixture may be used to provide concrete mixtures conforming to the specified maximum slump and water- cementitious material ratio values.
2. HRWR admixtures shall be incorporated into the concrete mixtures at the batch plant or in the field through an approved dispensing unit. Water content of this concrete will be verified on the job site by use of the specified microwave test.
3. Self-consolidating concrete shall always use a high-range, water-reducing admixture.

G. **Self-Consolidating Concrete** shall be proportioned in accordance with ACI 237 and shall be subjected to trial mixes and placements. Self-consolidating concrete mixes shall include high-range, water-reducing (HRWR) and viscosity modifying (VMA) admixtures. In addition to the mix design submission requirements for normal concrete, self-consolidating concrete mixtures shall include:

1. Slump-flow, visual stability index, and T50 test results in accordance with ASTM C 1611. The slump-flow should meet the value tabulated in Table 2.1-3.2. The visual stability index should be 0.
2. Passing ability test results in accordance with ASTM C 1621. Acceptable passing ability is where the J-ring test is within 2” of the slump-flow test, unless more stringent criteria apply.
3. Stability test results in accord with ASTM C 1712. Acceptable penetration depth is less than ½”.
4. The level of slump flow or water content at which the mixture becomes unstable shall be determined and reported. Successive amounts of high range water reducing admixture or water shall be added to the trial mix and slump flow, visual stability index and T50 shall be measured. The level of slump flow or water content at which the mix becomes unstable shall be submitted.
5. Due to the sensitivity of self-consolidating concrete to changes in batching quantities, resiliency tests must be conducted and submitted for each design mix to ensure robustness of the mix within allowable lab tolerances. The strength and workability tests results for these resiliency tests shall fall within allowable tolerances. Tests shall include at a minimum:
   a. One batch test where the powder content of the design mix is increased 2% and the water content is decreased 2%.

b. One batch test where the powder content of the design mix is decreased 2% and water content is increased 2%.

H. **Drying Shrinkage Limitations**: All concrete placed above grade, except footings and grade beams, shall comply with the following drying shrinkage requirements:

1. Prior to placement of concrete, a trial batch of mix designs requiring shrinkage control shall be prepared using aggregates, cement and admixtures proposed for each class. From each trial batch, at least 3 specimens for determining the Drying Shrinkage shall be prepared in addition to 6 compression test specimens.
2. The Drying Shrinkage specimens shall be 4 x 4 x 11 inch (100 x 100 x 280 mm) prisms, fabricated, moist cured, air dried and measured in the manner provided in ASTM C 511 and as modified herein. Specimens shall be air dried after moist curing for 7 days and shall be measured at an age of 14, 21, 28, and 35 days. The effective gauge length of the specimens shall be 10 inches (254 mm).
3. Compression test specimens shall be fabricated, cured and tested in accordance with ASTM C 192. Three specimens shall be tested at an age of 7 days and three at the age of 28 days.
4. During construction, Drying Shrinkage specimens of each shrinkage class of concrete will be taken to insure continued compliance with these Specifications. For each shrinkage class of concrete, at least one set of three specimens will be taken from each 1000 cubic yards (765 cubic meters) of concrete placed, but in no case less than three sets of specimens (i.e., nine specimens) will be taken for each class.
5. The average Drying Shrinkage of the laboratory test specimens after 28 days of drying shall not exceed 0.040 percent or 0.020 percent where noted in the Contract Documents. Considering the variations in concrete properties and in testing, a tolerance of 30 percent in the above figure will be accepted for field cast specimens.

I. **Water-Cementitious Material Ratio:** Calculate water-cementitious material ratio by dividing the weight of total free water (including water found in each admixture) in the concrete, per unit volume, by the number of pounds of cementitious material per unit volume. Total free water shall be taken as the total free water content of the mix when proportioned to produce the maximum allowable slump. Cementitious material is defined as cement, silica fume, fly ash and other natural pozzolans, and blast furnace slag. Water-cementitious material ratio shall be the decimal rounded to two significant figures obtained by dividing the total free water weight per cubic yard (meter) by the total weight of cementitious material per cubic yard (meter).

J. **Cement Grout** shall be composed of 1 part Portland cement and 3 parts fine aggregate, by volume, with minimum water to produce a stiff, but workable mix.

K. **Source Changes:** Should the source of an ingredient change, for any of the concrete products specified herein, Contractor shall redesign the affected mix and shall resubmit, all prior to incorporating such material into the Work.

L. **Test Report Requirements:** Contractor's test reports and Testing Agency test reports shall be prepared in a format as given in this Specification.

1. Mixes shall be designated by a number (Mix No. 1, Mix No. 2,...etc).
2. Individual samplings of a particular mix shall be designated by a number, with the first sample given the number 100 (Sampling 100, Sampling 101,...etc).
3. Test cylinder numbers shall be provided using the sample number and a letter (102A, 102B,...etc).

4. **Contractor's Professional Engineer licensed in the project's jurisdiction shall review and shall sign each concrete test cylinder report indicating that the test shows conformance with the requirements of the Contract Documents.**
5. **Deviations from project requirements shall be identified clearly by circling non-conforming data and by overprinting in 1/2 inch (13 mm) high red letters "NON-CONFORMING."**
6. For self-consolidating concrete mixes, provide, in addition, all workability test criteria reports attached to this Specification format.

SPACE FOR LABORATORY LETTERHEAD

REPORT OF CONCRETE COMPRESSIVE STRENGTH TESTS
SUNY NEW PALTZ PEREGRINE DINING HALL

FIELD DATA: Date: _____ Time: _____ Normal Wt. ( ) Lightweight ( )

Contractor: _____ Placement _____
Concrete Supplier: _____ Locations _____

Conveyance Method:
Bucket( ) Pump( ) Chute( ) Buggy( ) Tremie( ) Other _____

MIX NUMBER:		Cylinder Field Cure Data			Technician's Name:
Slump,	inches	Time,	days		
Air Content,	%	Min Temp,	°F		Tests by:
Concrete Temp,	°F	Max Temp,	°F		
Ambient Temp,	°F	Curing Box	( )		Cylinders by:
Fresh Unit Wt,	pcf	Other			

MIX PROPORTIONS:		Batch Quantities Per Cubic Yard	Materials and Sources
Cement	(lb)		
Water - Batched	(gal)		
Water - Added	(gal)		
Fine Aggregate	(lb)		
Coarse Agg.	(lb)		
Admixture	(fl. oz)		
Admixture	(fl. oz)		
Fly Ash or Slag	(lb)		
Silica Fume	(lb)		
Chloride Ion	(%by wt.of cem)		
Macro Synthetic Fibers	(lb/cy)		

TEST RESULTS:

Cylinder Number	Cylinder Weight	Age (Days)	Comp. Strength (psi)	Split Strength (psi)	Remarks
Specified:					

For lightweight concrete:
Air-dry weight per ASTM C 567 _____ Pcf.

_____ P.E.
Seal and Signature

2.2 CONCRETE INGREDIENTS

A. **Cement:** Provide an accepted, single source, standard brand Portland cement, conforming to ANSI/ASTM C 150, Type I, II or III or ANSI/ASTM C 595, Type IP. Cement shall be from a single domestic source.

1. Use Type I or Type II cement except where another cement is herein specified and except where permitted.
2. For Slabs-on-Ground Concrete, provide ANSI/ASTM C 150, Type I or II, from a single domestic source.

B. **Aggregate:** Fine and coarse aggregates shall be regarded as separate ingredients. All aggregates shall meet the requirements listed below except that, where accepted by *Building Code*, non-conforming aggregates will be considered in accordance with the provisions of the Contract Documents.

1. Coarse Aggregate: shall conform to ANSI/ASTM C 33, and shall consist exclusively of sound and durable gravel or crushed stone, having clean, uncoated, hard and strong particles, free from soft, thin, elongated or laminated particles, and from deleterious materials such as alkali, organic, soft or expansive matter. ASTM Grade Size #67 (19 to 4.8 mm), #57 (25 to 4.8 mm) or #467 (37 to 4.8 mm). Aggregates in excess of 3/4 inch (19 mm) shall not be used except in footings and pile caps, except where required specifically by this Specification or by the Drawings and except where accepted in writing. Water absorption of dry aggregate shall not exceed 1 percent.
2. Lightweight Coarse Aggregate: shall be a rotary kiln product of expanded shale or slate, conforming to ANSI/ASTM C 330, ASTM Grade Size #67 (19 to 4.8 mm) or ASTM Grade Size #8 (9.5 to 2.4 mm), and shall conform also to all requirements for Coarse Aggregate.
3. Fine Aggregate: shall conform to ANSI/ASTM C 33, consisting exclusively of natural sand or crushed stone screenings, having clean, uncoated, hard and strong particles, free from clay, shale, lumps, salt and flaky particles, and from deleterious materials such as alkali, organic, soft or expansive matter. Fine aggregate shall be evenly graded from fine to coarse, with a fineness modulus not less than 2.30, nor more than 3.10.
4. Combined aggregate gradation for slabs and other designated concrete shall be 8% - 18 % for large top size aggregates (1 ½ in.) or 8%-22% for smaller top size aggregates (1 in. or ¾ in.) retained on each sieve below the top size and above the No. 100.
5. Concrete Topping: Coarse aggregate shall conform to ANSI/ASTM C 33 or C 330 as appropriate, ASTM Grade Size #7 or #8 (12 mm to 4.8 mm or 9.5 mm to 2.4 mm) and shall conform also to all requirements for Coarse Aggregate given above. Fine aggregate shall conform to all requirements for Fine Aggregate as given above.
6. Cement Finish: Aggregates shall be graded from 1/8 (3 mm) to 3/8 inches (10 mm), with not less than 95 percent of aggregate weight passing the 3/8 inch (10 mm) sieve.
7. Cleanliness of Aggregate: Aggregates shall have a minimum C.V. (cleanliness value) and a minimum S.E. (sand equivalent) of 75.0. Three samples shall be taken from the weight hopper and the average of the results of the three individual tests shall be the accepted value. Tests shall be taken throughout the course of the Work. Deviation from the accepted value will be the cause of rejections of the material.

C. **Water:** Mixing water for concrete shall be clean, fresh, free from injurious amounts of oil, acid, alkalis, salts, organic materials and other deleterious materials and shall conform to ASTM C1602. Antifreeze agents may not be used unless accepted in writing. In case of uncertainty, water shall be potable.

D. **Admixtures** listed below by name and by brand are accepted for use in the Work. Other admixtures will be considered for use but are subject to acceptance. Admixtures contributing to chloride, fluoride, sulfide or nitrate ions, or to other substances detrimental to the ingredients of the concrete or to reinforcing steel, will not be permitted in the Work.

1. Water-Reducing Admixture shall conform to ASTM C 494, Type A.
   a. Pozzolith 322-N or Polyheed 997, by BASF.
   b. WR-91, or Plastol Series, by Euclid Chemical Co.
   c. Plastocrete 161 or Sikament HP, by Sika Corp.
   d. WRDA with HYCOL or Daracem 55, by W.R. Grace Construction Products.
   e. Other accepted admixture.
2. Retarding Admixture shall conform to ASTM C 494, Type B.
   a. Delvo ESC, by BASF.
   b. Eucon Retarder 100, by Euclid Chemical Co.
   c. Other accepted admixture.
3. Non-corrosive, Non-Chloride Accelerator: The admixture shall conform to ASTM C 494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. The admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory (of at least a year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures. Type C Admixtures are:
   a. Pozzutec 20+, by BASF.
   b. Accelguard 80, 90 or NCA by Euclid Chemical Co.
   c. Sika Rapid-1, by Sika Corp.
   d. Polarset, by W.R. Grace Construction Products.
   e. Other accepted admixture.
4. Water-Reducing, Retarding Admixture shall conform to ASTM C 494, Type D.
   a. Pozzolith 100 XR or 300 R, by BASF.
   b. Eucon Retarder 75 or 100, by Euclid Chemical Co.
   c. Plastiment or Plastocrete 161MR, by Sika Corp.
   d. Daratard 17, by W.R. Grace Construction Products.
   e. Other accepted admixture.
5. Non-Corrosive, Water-Reducing, Accelerating Admixture shall conform to ASTM C 494, Type E.
   a. Polyheed FC100, by BASF.
   b. Accelguard 80, 90, or NCA, by Euclid Chemical Co.
   c. Plastocrete 161FL, by Sika Corp.
   d. Other accepted admixture.
6. High-Range Water-Reducing Admixture (Superplasticizer) shall conform to ASTM C 494, Type F.
   a. Rheobuild 1000, by BASF.
   b. Eucon 37/1037, or Plastol Series by Euclid Chemical Co.
   c. Sika ViscoCrete 2100, by Sika Corp.
   d. ADVA 140M, by W.R. Grace Construction Products.
   e. Other accepted admixture.
7. High-Range Water Reducing, Retarding Admixture (Superplasticizer) shall conform to ASTM C 494, Type G.
   a. Eucon Retarder 75, by Euclid Chemical Co.
   b. Daracem 100, by W.R. Grace Construction Products.
   c. Other accepted admixture.
8. Air-Entraining Admixture shall conform to ANSI/ASTM C 260.
   a. Micro-Air or MB AE 90, by BASF.

b. AEA-92 or Air Mix, by Euclid Chemical Co.
c. Sika AER or Sika AEA-15, by Sika Corp.
d. Daravair 1000 or Darex II AEA, by W.R. Grace Construction Products.
e. Other accepted admixture.

9. Prohibited Admixtures: Calcium chloride thiocyanates and admixtures containing more than 0.05% chloride ions are not permitted
10. Calcium Nitrite Based Corrosion Inhibitor Admixture shall contain a minimum of 30 percent of calcium nitrite by weight.
    a. Rheocrete 222+, by BASF.
    b. Eucon CIA, by Euclid Chemical Co.
    c. DCI S, by W.R. Grace Construction Products.
    d. Other accepted admixture.
11. Shrinkage-Reducing Admixture.
    a. Tetraguard AS 20, by BASF.
    b. Eucon SRA or Conex, by Euclid Chemical Co.
    c. Sika Control 40, by Sika Corp.
    d. Eclipse, by W.R. Grace Construction Products.
    e. Other accepted admixture.
12. Viscosity Modifying Admixture for Self-Consolidating Concrete.
    a. Rheomac VMA 362 and 450, by BASF.
    b. Eucon DS or Eucon Stasis, by Euclid Chemical Co
    c. Sika Stabilizer 300 SCC, by Sika Corp.
    d. V-Mar 3, by W.R. Grace Construction Products.
    e. Other accepted admixture.

E. **Chloride Ion:** It is understood that certain admixtures do contain a concentration of calcium chloride. Design mix shall contain a summary of total calcium chloride concentration, including the content of admixtures. Total concentration in excess of that listed in ACI 318 Table 4.4.1 will be rejected without further review. Concentrations less than those listed in ACI 318 Table 4.4.1 may be accepted where, in the sole opinion of Construction Manager or of Architect, such concentration will not be detrimental to the Work. The amount of calcium chloride shall be determined by the method described in ASTM C 1218.

F. **Fly Ash** shall conform to ASTM C 618, Class C or F except that loss on ignition shall not exceed 3 percent and maximum percentage retained on the #325 (45 µm) sieve shall not exceed 20 percent. Fly ash shall be from a single, accepted source.

G. **Natural Pozzolans**, such as calcined clay, calcined shale, and metakaolin, shall conform to ASTM C618, Class N.

H. **Silica Fume** (microsilica) shall contain a silicon dioxide (SiO_2) content not less than 92%, shall be of either dry densified or slurried form, conforming to ASTM C 1240, and shall come from a single, accepted source:

1. Rheomac SF 100, by BASF.
2. Eucon MSA, by Euclid Chemical Co.
3. Sikacrete 950DP, by Sika Corp.
4. Force 10,000D, by W.R. Grace Construction Products.
5. Other accepted microsilica based admixture.

I. **Blast Furnace Slag** shall conform to ASTM C 989, Grade 120.

J. **Fibrous Reinforcement** shall conform to ASTM C 1116 Type III.

1. Synthetic Macro-Fibers: Structural fibers shall be a coarse monofilament, self-fibrillating, polypropylene/ polyethylene blend in accordance with ASTM C1116, Paragraph 4.1.3, Type III. Structural fiber shall have a minimum tensile strength of 73 to 80 ksi and a minimum length of 1.5 inches.
   a. Tuf-Strand SF, by Euclid Chemical Co.
   b. Strux 90/40, by W.R. Grace Construction Products.
   c. Other accepted fiber reinforcement.

2.3 FORMWORK MATERIALS

A. **Form Contact Faces:**

1. For Surfaces Not Exposed To View:
   a. Lumber shall be stress grade lumber described and used in accord with the National Design Specification for Wood Construction. Lumber shall be dressed on three sides and ends for a tight fit.
   b. Plywood for formwork shall be in accordance with U.S. Product Standard PS-1, Structural 1 "B-B (Concrete Form) Plyform", Exterior Grade, mill oiled and edge-sealed, not less than 9/16 inch (14 mm) thick. Field cut edges shall be resealed with a solvent-based sealant. Each piece shall bear the legible inspection trademark.
2. For Surfaces Exposed to View and for Multiple Reuse Applications:
   a. Plywood for formwork shall be in accordance with U.S. Product Standard PS-1, Structural 1" B-B (Concrete Form) Plyform", Douglas Fir, Exterior Grade, High Density Overlay (HDO) thermo-set resin-impregnated, mill oiled and edge-sealed, not less than 9/16 inch (14 mm) thick. Field cut edges shall be resealed with a solvent-based sealant. Each piece shall bear the legible inspection trademark. Provide Pourform-HDO by Savona Specialty Plywood, or other accepted form.

B. **Form Sealers and Release Agents** shall be guaranteed by manufacturer to be non-grain raising, non-staining and to not impair the natural bond of paint, waterproofing and other surface coatings.

2.4 REINFORCEMENT MATERIALS

A. **Reinforcing Bars, Column Ties, etc.:** Except where more stringent requirements are given in the Drawings or required by *Building Code*, provide ASTM A 615, new billet steel, deformed. Rail, axle, or rerolled steel shall not be used.

1. Provide Grade 60 unless otherwise given in the Drawings or in this Specification.
2. Steel wire shall conform to ASTM A 82, plain, cold-drawn steel.

B. **Welded Steel Wire Fabric:** ANSI/ASTM A 497 (deformed wire) for sizes D4.0 and larger and A 185 (plain wire) for sizes less than W4.0, produced by a domestic manufacturer, with a minimum tensile strength not less than 70,000 psi (480 MPa). Provide, deliver and store as flat sheets only; rolls will not be permitted.

C. **Tie Wire:** 18 gauge (1310 µm) or heavier, black annealed wire, conforming to ANSI/ASTM A 82. Tie wire in concrete at exposed surfaces shall be non-corrosive; stainless steel, monel, or plastic coated.

D. **Bolsters, Chairs, Spacers**, and other devices for spacing supporting and fastening reinforcing bars and welded wire fabric:

1. Accessories shall be all-plastic or shall be plastic coated metal. Metal may not extend closer than 1/8 inch (3 mm) to concrete surface. Plastic color shall match finished concrete color. Conform to CRSI requirements.
2. For concrete surfaces exposed to view, bar supports shall be CRSI, Class 1 (plastic protected) or CRSI, Class 2 (stainless steel protected). Acceptable manufacturers are Dayton Superior, or other accepted manufacturer.
3. Precast concrete blocks furnished for reinforcement support shall be produced specifically for intended purpose; brick, stone, wood and other materials will not be permitted. Precast concrete blocks three inches (75 mm) or larger shall have the same compressive strength as the structural concrete in which they are used. Precast blocks smaller than three inches (75 mm) shall be 6,000 psi (41 MPa) at time of use.
4. For slabs-on-ground, use precast concrete blocks or supports with base plates or with horizontal runners at all locations where base materials will not properly support the legs of chairs.

2.5 MISCELLANEOUS MATERIALS

A. **Non-Shrink Grout** shall be natural aggregate grout pre-mixed and bagged by manufacturer. Non-shrink grout shall conform to ASTM C 1107 Grade B or C when tested at a fluid consistency of less than 30 seconds per ASTM C 939 at temperature extremes of 40°F and 90°F (7°C and 32°C) and an extended working time of 30 minutes. The corresponding minimum compressive strength of the grout at 28 days, based on ASTM C 942, shall be 7500 psi. The grout shall exhibit no measurable bleed when tested in accordance with ASTM C 940.

1. Sure-Grip High Performance Grout, by Dayton Superior.
2. Hi-Flow Grout, by Euclid Chemical Co.
3. Five Star Fluid Grout 100, by Five Star.
4. Masterflow 928 Grout, by MBT Technologies and Repair.
5. Other where accepted.

B. **Epoxy Grout** shall be non-shrink, 100% solids, 3-component, moisture tolerant grout.

1. E3-F, by Euclid Chemical Co.
2. Five Star Epoxy Grout, by Five Star.
3. Masterflow 648 CP, by MBT Technologies and Repair.
4. Sikadur 42, by Sika Corp.
5. Other where accepted.

C. **Bonding Admixture** shall be Latex type, non-redispersable, modified sand cement mortar conforming to ASTM C 1059, Type II.

1. Day-Chem Ad Bond, by Dayton Superior Corp.
2. Flex-Con or SBR Latex, by Euclid Chemical Co.
3. Everbond, by L&M Construction Chemicals, Inc.
4. Strong Bond, or Sure Bond (EVA), by Symons Corp.
5. Other where accepted.

D. **Epoxy Adhesive** shall conform to ASTM C 881, and shall be a two-component, 100% solids material, suitable for use on both dry and wet surfaces. Acceptable materials:

1. Sure-Anchor Epoxy, by Dayton Superior Corp.
2. Dural #452 Series or Duralprep AC, by Euclid Chemical Co.
3. Concresive Standard Paste LVI, by MBT Technologies and Repair.
4. Sikadur 32 Hi-Mod or Sikadur 32 Hi-Mod LPL, by Sika Corp.
5. Rezi-Weld 1000, by W.R. Meadows, Inc.
6. Other where accepted.

E. **Polymer Repair Mortar:** These patching mortars may be used when color match of the adjacent concrete is not required. Prior approval by the Structural Engineer is required.

1. Polyfast FS, by Dayton Superior.
2. Thin Top Supreme or Concrete Top Supreme (horizontal repairs), Verticoat or Verticoat Supreme (vertical and overhead repair),by Euclid Chemical Co.
3. Sikatop 121 & 122 (horizontal repair), Sikatop 123 (vertical and overhead repairs), by Sika Corp.
4. Other where accepted.

F. **High Strength Flowing Repair Mortar** for forming and pouring structural members, or large horizontal repairs, provide the flowable one-part, high strength microsilica modified repair mortar with 3/8" aggregate. The product shall achieve 9000 psi @ 28-days at a 9-inch slump.

1. Eurococrete, or Euco Speed MP (Cold Weather) by Euclid Chemical Co.
2. Polyfast LPL, by Dayton Superior.
3. Emaco S77 CI, by MBT Protection and Repair.
4. Other where accepted.

G. **Fusion Bonded Epoxy Coating** shall conform to ASTM A 775. Acceptable manufacturer is ScotchKote 413 by 3M, or other where accepted.

H. **Patching Material for Epoxy Coated Reinforcement** shall be ScotchKote 413/215 PC Patch Compound by 3M or other accepted patch material.

I. **Post-Installed Mechanical Anchors** shall be either expansion or undercut type. Where substitutions are requested, the alternate anchor shall be similar in type to that specified in the Contract Documents and be designed in accordance with substitution requirements.

1. Standard Wedge-Type Expansion Anchors:
   a. Kwik Bolt 3 and TZ, by Hilti Corp.
   b. Power-Stud+ SD1 and SD2, by Dewalt Anchors & Fasteners.
   c. Strong-Bolt 2, by Simpson Strong-Tie
   d. Other where accepted
2. Heavy-Duty Wedge-Type Expansion Anchors:
   a. HSL 3 Heavy Duty Sleeve Anchor, by Hilti Corp.
   b. Power-Bolt+, by Dewalt Anchors & Fasteners.
   c. Other where accepted

3. Undercut Expansion Anchors:
   a. HDA Undercut Anchor, by Hilti Corp.
   b. CCU+, by Dewalt Anchors & Fasteners.
   c. Torq-Cut, by Simpson Strong-Tie
   d. Other where accepted
4. Galvanizing shall conform to ASTM B 695, Class 50 or to ASTM B 633, SC1.
5. Stainless steel for studs and washers shall conform to AISI Grade 304 or Grade 316 and to ASTM F 593, Group 1 or Group 2, Condition SH. Nuts shall be of stainless steel conforming to ASTM F 594, Group 1 or Group 2, Condition SH.

J. **Post-Installed Adhesive Anchors** shall be either acrylic or epoxy, injectable type. Where substitutions are requested, the alternate adhesive shall be similar in type to that specified in the Contract Documents and be designed in accordance with substitution requirements.

1. Acryllic or Vinylester Adhesive:
   a. HY200 with SafeSet, by Hilti Corp.
   b. AC100+ Gold, AC200+ with Dust X+, by Dewalt.
   c. Other where accepted
2. Epoxy Adhesive:
   a. Hilti RE 500 V3 with SafeSet, by Hilti Corp
   b. Pure220+ with Dust X, by Dewalt.
   c. SET-XP, by Simpson Strong-Tie
   d. Other where accepted
3. Galvanizing shall conform to ASTM B 695, Class 50 or to ASTM B 633, SC1.
4. Stainless steel for studs and washers shall conform to AISI Grade 304 or Grade 316 and to ASTM F 593, Group 1 or Group 2, Condition SH. Nuts shall be of stainless steel conforming to ASTM F 594, Group 1 or Group 2, Condition SH.

K. **Expansion Dowels** shall be ASTM A 36 bars or equivalent, hot-dip galvanized, of the size and spacing given in the Drawings, and shall be provided with a suitable expansion shield securely positioned and end filled by readily compressible material assuring adequate expansion space beyond the free end of the dowel.

1. Acceptable Expansion Dowel Basket Assemblies for use in Slab-on-Ground Contraction Joints: Load Plate Basket Assembly by PNA Construction Technologies or other accepted.
2. Acceptable Expansion Diamond-Shaped Load Plates for use in Construction Joints: Diamond Dowel System by PNA Construction Technologies or other accepted.

L. **Waterstops** shall be extruded from a virgin poly vinyl-chloride compound meeting all of the requirements set forth in the U.S. Army Corps of Engineers Specification CRD-C-572. Select waterstop based on concrete profile, anticipated joint movement, maximum possible water pressure and placement. Only where the requirements of CRD-C-572 are met, provide the following:

1. Construction Joints: Provide 6" (150 mm) wide dumbbell type or ribbed type.
   a. Type DB-5 or 11B, by DuraJoint Concrete Accessories.
   b. Style 746 or 782, by Greenstreak.
   c. Type M, by Progress Unlimited.
   d. Number D6-316 or R6-316T, by Vinylex Corp.
   e. Other where accepted.
2. Expansion Joints: Provide 9” (230 mm) wide, serrated type with center bulb.
   a. Type 7BR, by DuraJoint Concrete Accessories.
   b. Style 696, by Greenstreak.

c. Type W-5, by Progress Unlimited.
d. Number RLB9-38(Ribbed Center Bulb), by Vinylex Corp.
e. Other where accepted.

3. **Hydrophilic waterstop** shall consist of 75% sodium bentonite and 25% butyl rubber compound formed into uniform coils. Waterstop to be installed per manufacturer's guidelines using a non-flammable, latex and water based adhesive used to secure hydrophilic waterstops. Locations need be submitted for approval to Structural Engineer and Architect.
   a. Waterstop-RX, by Colloid Environmental Technologies Company.
   b. Swellstop, by Greenstreak.
   c. Expand Tite, by DuraJoint Concrete Accessories.
   d. Other where accepted.
4. Transformer Vault Construction Joints: Waterstops shall conform to requirements of the power company specification for customer-built transformer vaults and shall be subject also to acceptance.

M. **Polyurethane Sealant** shall be Eucolastic I by Euclid Chemical Co., Dymonic by Tremco, Inc., Sikaflex-1a by Sika Corp., or other accepted sealant. Sealant shall conform to ASTM C920. Color shall be accepted by Architect. Backer rod shall be as recommended by sealant manufacturer.

N. **Joint Filler:**

1. Unless otherwise noted, use non-staining, non-extruding, compressible and resilient joint filler of sponge rubber conforming to ASTM D 1752, Type I. Joint fillers which contain or have been treated with oil, grease or bituminous materials are prohibited. Test joint fillers for compatibility with proposed primers and sealants.
2. Acceptable preformed joint filler: FF-3 Sponge Rubber, by Progress Unlimited, Inc.; Cementone Sponge Rubber, by Tamms Industries; or other accepted filler.
3. Provide compatible joint sealing compound: ♣See Specification Section 07 92 00.

O. **Cellular Polystyrene** shall conform to ASTM C 578, Type IV or better and shall be sufficiently hard and dense and/or shall be sealed so as to preclude completely the dispersing of Styrofoam particles into the plastic concrete. Acceptable cellular polystyrene: Styrofoam Cavitymate Plus, by The Dow Chemical Co., or other acceptable cellular polystyrene.

P. **Bond Breaker** shall be 4 mil (100 µm) thick polyethylene sheet.

Q. **Moisture-Retaining Cover Conforming to ASTM C171:** A naturally colored, non-woven polypropylene fabric with a 4-mil non-perforated reflective (white) polyethylene coating containing stablizers to resist degradation from ultraviolet light. Acceptable Moisture-Retaining Cover: Hydracure S-16 by PNA Construction or Transguard 4000 by Beef Industries.

R. **Vapor Barrier** for slab-on-ground shall conform to ASTM E1745, Class B. The vapor barrier shall be placed over prepared base material where indicated below slabs on grade. Lap sealant shall be the manufacturer's recommended bonding material.

1. Perminator (20 mil) Vapor Barrier, by W.R. Meadows.
2. VIAFLEX Vaporblock (20 mil) Vapor Barrier, by Strongman Safety Products.
3. Vapor Block Plus (20 mil) Vapor Barrier, by Americover.
4. Yellow Guard 20 mil Vapor Barrier, by Poly-America.
5. Other accepted barrier.

S. **Crushed Stone:**

1. Under slabs-on-ground shall consist of a crusher-run stone subbase coarse of Type 2 Subbase or ASTM C33 Blend 57 at least 6" in depth. See the Geotechnical Report.

T. **Pachometer** (reinforcing bar locator scanner): Use James R-Meter by James Instruments or other accepted pachometer.

U. **Spark Tester** for testing waterstop splices: Use Spark-Tester by JP Specialties Inc. or other accepted manufacturer.

2.6 SURFACE TREATMENTS

These products are compliant with the requirements of Ozone Transport Commission (OTC), which includes NY and NJ, of a maximum 350 g/l VOC limit.

A. **Clear Curing and Sealing Compound** VOC Compliant, 350 g/l, shall be a liquid type membrane-forming curing compound, complying with ASTM C 1315, Type I, Class A, 25% solids content minimum. Moisture loss shall be not more than 0.40 kg/m2 when applied at 300 sq. ft./gal. Compound shall be compatible with all subsequent finishes and toppings, shall chemically combine fully with the concrete in 30 days or less, shall leave no surface residue, and shall preclude secondary reactions within concrete as well as materials applied to the concrete surface. Manufacturer's certification is required. Subject to project requirements, provide one of the following products:

1. Super Diamond Clear VOX, by Euclid Chemical Co.
2. Lumiseal WB Plus, by L&M Construction Chemicals, Inc.
3. Kure 1315, by Sonneborn Products.
4. Other where accepted.

B. **Dissipating/Non-residue Forming (Strippable) Curing Compound** (VOC Compliant, 350 g/l) shall be a liquid membrane-forming compound conforming to ASTM C 309, Type 1 or 1-D that chemically breaks down and wears off after curing is complete. Install in strict accordance with the manufacturer's recommendations. Manufacturer's certification is required.

1. Kurez DR VOX, by Euclid Chemical Co.
2. L&M Cure R, by L&M Construction Chemicals, Inc.
3. Kure-N-Harden, by Sonneborn Products.
4. 1100-Clear Series, by W. R. Meadows, Inc.
5. Other where accepted.

C. **Evaporation Retarder/Finishing Aid:**

1. Eucobar, by Euclid Chemical Co.
2. E-Con, by L&M Construction Chemical, Inc.
3. Confilm, by MBT Protection and Repair.
4. SikaFilm, by Sika Corp.
5. Other where accepted.

D. **Surface Retarder:**

1. A-H Retard Set, by Anti-Hydro International, Inc.
2. True Etch Surface Retarder, by Burke.
3. Concrete Surface Retarders, by Euclid Chemical Co.
4. Rugasol-S, by Sika Corp.
5. Other where accepted.

PART 3 - EXECUTION

3.1 CONTRACTOR'S INSPECTION

A. **Examination of Field Conditions:** Examine all surfaces, features and facilities to which Work must be attached or applied, abut or clear. Notify Construction Manager and Architect in writing of all conditions which are or will be detrimental to proper and expeditious installation of Work.

B. **Field Measurements:** Contractor shall verify, by measurements at the job site, all dimensions affecting the Work of this Section. Field dimensions at variance with those in accepted Shop Drawings shall be reported in writing by Contractor. .

3.2 FORMWORK

A. **Reference Standards:** Formwork shall conform to ACI 347R, except where more stringent requirements are given in the Drawings or in this Specification.

B. **General:** Contractor shall be solely responsible for the design, engineering, construction, completeness, safety and adequacy of all concrete formwork. Provide removable formwork for all concrete not indicated specifically to be formed by other means. Provide for anchorages and inserts, blocking, bulkheads, chamfers, keys and keyways, ledges, moldings, offsets, openings, recesses, reglets, screeds and all else to complete the Work.

1. Formwork shall be designed and constructed to withstand all forces imposed upon the formwork including all construction dead and live loads, horizontal loads from equipment, wind and earthquake forces, and forces due to vibration of plastic concrete. Shoring shall be adequate in strength and in position so that loads of successive parts of the structure will be transmitted directly through the falsework without the creation of shearing or bending stresses in the concrete Work. Shoring shall not bear on slabs on ground until such concrete has attained design strength and only where the slab-on-ground is able to accept the imposed loads without distress.
2. Formwork shall be tight to prevent leakage of mortar from the concrete so as to provide concrete free of honeycombs, shall be of adequate rigidity and strength, and shall be adequately braced to produce true lines, free of bulges and unsightly depressions, to accurate elevations and correct alignments.

C. **Self-Consolidating Concrete Formwork:**

1. Self-consolidating Concrete: Due to the fluid nature of self-consolidating concrete, higher pressures than conventional concrete should be expected and accounted for in formwork design. Where noted in the contract documents that self-consolidating concrete shall be pumped from the bottom of the forms, consideration shall be given to the additional pressure on the formwork from pumping.

D. **Construction and Erection of Forms:**

1. To maintain specified tolerances, camber forms and shores for beams and slabs to compensate for anticipated deflections in the formwork prior to hardening of the concrete; provide additional camber where noted in the Drawings. Camber top surface and set screeds to maintain uniform thickness. Where Drawings do not show specific camber, provide a minimum camber equal to 1/4" (6 mm) for each 15 feet (4600 mm) of span (for flying beams, not supporting slabs or other beams, provide 1/8" (3 mm) for each 15 feet (4600 mm) of span); for cantilever spans, camber 1 inch (25 mm) for each 8 feet (2400 mm) of cantilever. Camber shall be parabolic, tapering from center of span to each support. Set screeds to follow camber so as to maintain a uniform thickness of concrete.
2. Build into formwork positive means of adjustment (wedges, jacks and the like) of shores and struts and take out all settlements during concrete placement operations. Brace forms securely against lateral forces and to prevent lateral deflections.
3. Build into the formwork and otherwise make necessary provisions in formwork to accommodate the Work of other Sections of this Specification.
4. Provide material with sufficient thickness so that newly placed concrete does not bow, distort or deflect formwork.
5. Contractor may use plywood, lumber, metal and other materials included under this Specification.
6. Protect Soft Materials such as Styrofoam from contact by vibrators and other equipment. Evidence of dispersion of such materials into concrete will be considered as evidence for rejection of that concrete.

E. **Cellular Polystyrene** panels shall be installed with staggered joints and shall be bonded with adhesives recommended by the manufacturer.

F. **Form Release Treatment:** Clean and treat all removable forms with form release agent prior to placing reinforcement and embedded items. Remove excess form release agent and do not allow agent to come in contact with previously placed concrete or reinforcing steel.

3.3 FABRICATION AND PLACEMENT OF REINFORCEMENT

A. **Reinforcing Steel shall be Shop Fabricated** in strict accord with the Shop Drawings, certificates, and other submitted and accepted data. All Work shall conform to the applicable Standards as given herein and as need apply to the Work.

B. **Reinforcing Steel**, whether existing or provided under this contract, shall be free from paint, oil, dirt, scale, ice, frost, loose rust, grease, clay or other soil, and other substances or coatings which could reduce bond with concrete.

C. **Placing Reinforcing Steel:** Comply with the more severe of ACI, CRSI, *Building Code* and this Specification.

D. **Reinforcing Bar Supports** shall be appropriate to the intended use, of sufficient number, spacing, rigidity and strength to prevent displacement of reinforcing and to hold reinforcing accurately in correct position both before and during concrete placement. Do not place reinforcing bars more than 2 inches (50 mm) beyond the last leg of continuous bar supports. Do not use bar supports as support for runways, conveying equipment or for any purpose other than for supporting reinforcing bars.

1. Use plastic or hot-dip galvanized supports.
2. For slab on ground, use chairs with base plates.
3. Securely tie and support reinforcement to prevent displacement by construction traffic and casting of concrete. Neither top nor bottom bars shall be allowed to sag below tolerances specified by Building Code or required by the Contract Documents. Concrete cover shall be uniformly maintained.

E. **Over Metal Deck**, reinforcing steel shall be tied securely and supported prior to placing concrete. WWF placed over metal deck shall be tied securely and may be pulled up to proper position as the casting of concrete progresses.

F. **Tack Welding** of reinforcing steel bars or mesh is prohibited. Reinforcement damaged by arc strikes or arc welding shall be replaced. Welding of reinforcing bar intersections is prohibited.

G. **Welding and Flame Heating** of reinforcing steel is prohibited unless performed in accord with appropriate qualified procedures and detail sketches prepared by Contractor and both submitted and accepted.

H. **Epoxy-Coated Reinforcement** shall be subject to all applicable provisions of this Specification and, in addition, shall be subject to the following provisions:

1. Cold bend all bars around pins with nylon collars and take other steps required to minimize damage of the coating during fabrication. Hot bending will not be permitted.
2. Handling and hoisting shall be done with care, making use of nylon lifting slings. Bundles of reinforcement shall be lifted in a manner to prevent abrasions; spreaders shall be used to lift bundles where lifting at third points is not practical. Bundling bands shall be padded or shall be nylon.
3. Store epoxy-coated reinforcement on padded or wooden cribbing.
4. Reinforcing bars used as support bars for epoxy-coated reinforcement shall be epoxy-coated.
5. Field bending and field cutting of epoxy-coated reinforcement will not be permitted except where authorized expressly in writing.
6. Epoxy-coated reinforcement shall be saw cut; flame cutting is prohibited.
7. Damage to coating on bars exceeding 0.3 inches (8 mm) in any direction shall be repaired in accord with the patching material manufacturer's published instructions. Bars requiring patching in excess of 2 percent of the surface area of that bar shall be rejected and shall be removed immediately from the site.
8. All damage (i.e., 100%) to coating on weld wire fabric shall be repaired in accord with the patching material manufacturer's published instructions. Welded wire fabric requiring patching in excess of 1 percent of the surface area per linear foot of each wire shall be rejected and shall be removed immediately from the site.
9. Splicing of epoxy-coated bars shall be by lap-splice or by accepted mechanical couplers.

I. **Macro Synthetic Fibers:** Provide where specified. Shall be added at a dosage of 4 lbs/cy or higher as required to achieve a minimum equivalent residual strength fe3 of 200 psi when measured in accordance with ASTM C1609.

J. **Drill-In Anchors**: At wall and slab surfaces to receive drill-in anchors, with written acceptance, it may be possible to place reinforcing steel to clear the depth of the field penetration. Whether or not permission is obtained, Contractor shall not cut or damage reinforcing steel in setting of after-set inserts or drill-in anchors or for any other reason.

K. **Lap Splices**: Reinforcing bars may be lapped in contact splices wired together or by lap lengths separated by spacing shown or noted in the Shop Drawings or permitted by this Specification.

L. **Straightening**: Once bent, the shop straightening of reinforcing bars is not permitted. The field straightening of bars that have been embedded in concrete is permitted only where authorized specifically.

1. For field bending, acceptance will require generally that larger bars be heated to 1200°F (700°C) maximum and that concrete be protected by insulation blankets. After straightening, acceptance will require that bars be insulated and cooled slowly.

3.4 JOINTS

A. **Construction Joints:**

1. Construction joints shall be made and located so as to least impair the strength and appearance of the structure. Construction joints shall be made only at locations shown in the Contract Drawings or accepted specifically. Construction joints shall conform to the *Building Code* and to ACI 318, Article 6.4. Location of all construction joints not shown in the Drawings shall be submitted for acceptance.
   a. All construction joints shall be keyed not less than 1-1/2 inches (40 mm) deep. Wood box-outs treated with a form release agent or cellular polystyrene box-outs shall be used for keying concrete; the chipping of keys after concrete placement as a construction methodology is prohibited. Continue all reinforcing steel across construction joints. Contractor shall supply, fabricate, and place additional reinforcing steel where location of construction joint in any way weakens the construction.
   b. Horizontal construction joints will not be permitted in beams and slabs except where shown in the Drawings. Horizontal construction joints in walls will not be permitted except where shown in the Drawings or in accepted Shop Drawings.
2. Spacing of Construction Joints: Conform to and do not exceed maximum distance between construction joints as shown or noted in the Drawings and in this Specification. Where no other restriction applies, provide construction joints at a spacing not greater than 33 feet (10 m) joint-to-joint in perimeter walls below grade; 65 feet (20 m) maximum joint-to-joint in perimeter walls above grade and all interior walls, above or below grade; 120 feet (36 m) maximum joint-to-joint and providing 10,000 square feet (836 square meters) maximum for slab pours;. In considering wall joints, a 90 degree corner may be considered a joint. Limitations on construction joint spacing do not apply to slabs on steel deck.
3. Column and Wall Joints: Cast columns and walls to an elevation 1/2 inch + 1/4 inch (13 mm ±6 mm) higher than the lowest abutting girder, beam or slab.

B. **Construction Joints Not Located in Drawings:**

1. For Cast-In-Situ Beam and Slab Construction: Where construction joints are not located in Drawings, submit proposed locations for acceptance. In general, in areas not specifically shown in Drawings, construction joints shall be located as follows:
   a. Slabs, Beams and Girders: Within the middle third of a span, unless a beam intersects a girder at this point, in which case the joints in girders shall be offset a distance equal to twice the width of the beam.
   b. Locate construction joints perpendicular to the main reinforcement.
2. For Slabs on Metal Deck Construction: Locate construction joints parallel to beams and girders, not closer than 6 inches (150 mm) to stud shear connectors.
   a. Where parallel to supporting beams, locate not more than 1'-8" (500 mm) from the centerline of a supporting beam such that most of the slab span containing the construction joint contains concrete from the first pour.
   b. Where perpendicular to supporting beams, locate not more than 3'-4" (1000 mm) from the face of the supporting girder such that most of the supporting beam is not concreted in the first pour.

C. **Expansion Joints:** Locate and construct as shown or noted in the Drawings. Do not continue reinforcement or conduit through expansion joints. Working width of expansion joints shall be kept free from all extraneous materials.

D. **Contraction Joints in Bearing Slabs on Ground:** Do not provide for slabs subjected to hydrostatic pressure. Locate and construct as shown or noted in the Drawings and as given in Shop Drawings.

1. Unless otherwise shown, provide at one half column bay spacing for macro synthetic fiber concrete with shrinkage less than 0.04% at 28 days no more than 27 times slab thickness, o.c., located neatly along column lines.
2. The Soff-Cut saw shall be used immediately after final finishing and to a depth of 1-1/4”. A conventional saw shall be used as soon as possible without dislodging aggregate and to a depth of 1/4 slab thickness. Remove all residue caused by sawing by water blasting immediately after joint is cut.
3. Contractor may form joint following dimensions provided in the Drawings.

E. **Joint Filler:** Joint filler shall be installed where indicated in the Drawings. Joint filler shall be full depth of joint and shall be set flush with exposed concrete surface, except where sealant or a reveal is indicated, in which case the joint filler shall be set back as detailed in the Drawings.

3.5 EMBEDDED WORK

A. **General:** Locate, set and build into the Work such embedded items as are required by the Work of this Section and by the Work of other Sections and Divisions of this Specification.

1. All embedded items required for adjoining Work or for its support shall be placed prior to placing of concrete and, where practicable, prior to placing reinforcing steel.
2. All other trades whose Work is related to cast-in-place concrete Work or whose work must be supported by cast-in-place concrete shall be given ample notice and opportunity to install or furnish embedded items before the affected concrete is placed.
3. Obtain setting diagrams and instructions from the supplier of item to be set and follow instructions implicitly.

4. Provide templates, set accurately to line and to level by transit and/or by laser level and anchor securely so as to not displace during placing and compaction of concrete.
5. Seal, temporarily pack and protect inserts and sleeves from intrusion of concrete or concrete mortar during concrete placement operations.
6. Aluminum: No aluminum shall be embedded in or shall be installed in contact with concrete Work unless provided with an accepted protective coating.

B. **Waterstops:** Provide and install continuous waterstops in strict accord with manufacturer's printed instructions and with this Specification.

1. Provide continuous waterstops as follows:
   a. at all construction joints in perimeter walls below grade;
   b. at all construction joints, isolation joints and expansion joints in retaining walls;
   c. at all control joints exposed to weather;
   d. at all uncaulked construction joints exposed to weather; and
   e. elsewhere where indicated in the Drawings.
2. Use maximum practical length to keep butt joints to a minimum.
3. Splice waterstops to form a continuous watertight seal. At junctions, use special shop fabricated ells, tees, and crosses. In slabs, turn up waterstops to be continuous with waterstops in walls. Thermostatically controlled electric splicers shall be used for all field splices, following procedures in strict accordance with manufacturer's printed instructions.

C. **Post-Installed Anchors** shown in the Drawings, or accepted in writing, shall be installed in strict accord with Manufacturer's Printed Installation Instructions. Set perpendicular to concrete surface. Anchors may be placed in block or brick work only where voids within 9 inches (230 mm) of the anchor have been filled solidly, with grout. Drilled holes shall be cleaned thoroughly with compressed air or water jet. Scanned all concrete surfaces to locate existing reinforcement prior to drilling for post-installed anchors so as to locate drilling and anchors to avoid damaging existing reinforcement.

3.6 CONCRETE VOLUME

A. **General**: Contractor shall provide all concrete volume necessary to accommodate cambers, natural or induced, and to compensate for deflection of structural members (beams, girders, columns and the like), deflection and settlement of formwork, and all other construction influences on the actual volume of concrete placed.

3.7 SLABS-ON-GROUND

A. **Codes:** Slabs-on-ground shall be constructed in accordance with ACI 302.1R *Guide for Concrete Floor and Slab Construction* and ACI 360R *Design of Slabs on Grade.*

B. **Porous Fill**: Work under this Section includes furnishing, placing and compacting of crushed stone under all slabs-on-ground. The porous fill shall be a total of 6 inches (150 mm) thick, crushed stone, unless otherwise shown in the Drawings, and shall be reasonably level.

1. Crushed stone shall be compacted in 6 inch (150 mm) maximum lifts using not less than four passes of a Wacker Vibratory Plate compactor or equivalent of sufficient capacity to achieve maximum density of the compacted porous fill.

2. The top of the compacted porous fill shall be not higher than the theoretical elevation taken from the Drawings.

C. **Vapor Barrier:** Provide over crushed stone. Overlap at joints and bond together with continuous lines of mastic, adhesive or tape in strict accord with manufacturer's printed instructions and ASTM E1643. Repair all punctures and tears just prior to pouring slab and maintain watertightness.

D. **Support Reinforcement** securely, on chairs with base plates or with precast concrete blocks, all as specified herein, or use other methods described in Shop Drawings and accepted.

3.8 MIXING AND DELIVERY OF CONCRETE

A. **Ready-Mixed Concrete:** All concrete shall be ready-mixed concrete. Measure, mix and deliver in accordance with ANSI/ASTM C 94, *Specification for* Ready-*Mixed Concrete*, and ACI 304R, Chapters 2, 3, 4, and 5 *Guide for Measuring, Mixing, Transporting and Placing Concrete*.

1. Plant equipment and facilities shall conform to the Check List Certification of Ready-Mix Concrete Production Facilities of the National Ready Mixed Concrete Association.
2. Ready mix equipment shall be completely automated.
   a. Computerized batch/truck ticket printouts shall be delivered to the Owner or Owner's inspection agency at time of concrete delivery to job site.
3. Provide site equipment in sufficient time to permit inspection, calibration, adjustment and repair as may be required before start of concrete Work.
4. Admixtures shall be measured and inserted into the mix at the plant except where written exceptions are obtained. The concrete producer shall provide a redosage chart for the high range admixture. This procedure assures a slump or slump flow is in the approved envelope.
5. Self-consolidating concrete should not be batched in quantities greater than 80% of the concrete truck capacity to prevent spillage during transit. Concrete truck operators should keep the revolving drum turning in the mixing mode direction while in transport.
6. If accepted by Structural Engineer, subject to the following conditions, water and/or admixtures may be added to the concrete at the site:
   a. Water shall not be added during transit, on site, or during placement to self-consolidating concrete.
   b. Design mixes indicate water and/or admixtures to be added at the site.
   c. Batch/truck tickets indicate the maximum amount of water and/or admixtures that can be added without exceeding the maximum specified water/cementitious ratio or admixture dosage.
   d. Water and/or admixtures are added in a manner to control volume.
   e. Concrete is properly remixed after addition of water and/or admixtures.
   f. Dosage and time of addition at the site are reported on batch/truck tickets and signed by Contractor's site quality control supervisor.

B. **Hand-Mixed Concrete** shall be used only where accepted specifically. Such concrete shall be mixed only in watertight containers, with dry materials measured by loose volume, sand and cement mixed together dry prior to adding coarse aggregate. Water, when added, shall be applied slowly with the entire mass turned to provide for an even mixture at all times.

C. **Hot and Cold Weather:** Comply with ACI 305 for hot weather and with ACI 306 for cold weather concreting.

3.9 PLACING CONCRETE

A. **Codes:** Concrete shall be placed in accordance with ACI 304R, *Guide for Measuring, Mixing, Transporting and Placing Concrete*, and shall be handled with due care to prevent deterioration due to delay or handling. Concrete shall be consolidated in accordance with ACI 309R.

B. **Clean Reinforcement**, whether existing, previously placed, or placed for the pour, to a condition not less clean than is required by this Specification, including referenced, cited and stipulated Codes and Standards.

C. **Clean and Seal Formwork:** Formwork shall be clean and free from frost, papers, sawdust, dirt and debris immediately prior to and during the time concrete is placed thereon.

D. **Concrete Pumping:** Subject to the provisions of this Specification, ACI 304R - Chapter 9 and ACI 304.2R, concrete may be conveyed and placed by pumping. Concrete shall be pumped through lines 5 inches (125 mm) in diameter or larger. Pumped concrete mix should provide the maximum practicable coarse aggregate content. Lightweight aggregate, where proposed for pumping, shall contain optimum moisture content for pumping, but not less than 16 percent absorbed moisture, based on the oven-dry weight of the lightweight aggregate. Pump lines shall be properly lubricated per ACI 304.2 prior to commencement of concrete placement.

E. **Slump and Slump-Form:** Concrete with slump or slump-flow exceeding the limits specified herein shall not be placed in the Work. Concrete with excessive slump shall be removed immediately from the site or may be used as lean concrete.

F. **Conveying of Concrete:** This Specification contemplates movement of fresh concrete from the point of receipt to the location of final deposit by concrete pumps, chutes, concrete bucket, pneumatic-tired buggies and combinations of the foregoing methods. Canvas or rubber "elephant trunks" of appropriate lengths shall be used to limit free fall of concrete. Chutes shall not be used to transport concrete for distances in excess of 30 feet (9 m) nor shall chutes be sloped greater than 1 vertical to 2 horizontal. Baffle plates shall be provided and other means shall be taken to prevent segregation. All devices used for conveying concrete shall be watertight, shall not allow concrete to come in contact with uncoated aluminum or with aluminum alloys and shall be cleaned thoroughly prior to use.

G. **Protect Formwork** including metal deck formwork, from damage by conveying equipment and systems.

H. **Clean, Tighten, Soak and Bonding Compound**: Prior to placing fresh concrete, retighten forms against previously placed concrete. Existing and previously cast concrete surfaces shall be first cleaned of laitance and deleterious materials, the surfaces shall be then roughened so as to remove all loose or damaged material that may be present. Finally, concrete surfaces shall be soaked with water. Standing water shall be removed.

I. **Coordination of Concrete Placement:** The batch plant, transit, conveying and placing operations shall be coordinated so that all concrete is in its final position within 1-1/2 hours from the time the mix is charged with water. Do not place concrete warmer than 90°F (32°C) except as provided in this Specification; for Architectural Concrete, the acceptable temperature of deposited concrete shall be between 50°F (10°C) and 86°F (30°C); for slab-on-ground concrete, the acceptable temperature of deposited concrete shall be between 50°F (10°C) and 70°F (21°C). The batching plant shall either provide chilled batch water or substitute crushed ice for part of the mixing water if required to satisfy specified concrete placing temperatures. Coordination shall be performed so that every deposit placed in the forms shall be covered by a subsequent deposit and consolidated within 15 minutes and in a continuous manner. Truck delivery, truck charging, crane positions, bucket size, tremie numbers and locations, lift heights, etc., shall be planned and directed toward achieving homogeneous and consistent placements.

J. **Placement of Concrete:** Do not begin until all reinforcing has been placed, secured, and inspected. Partially hardened or retempered concrete shall not be used in the Work. Concrete placement shall be carried out in a continuous manner between construction joints and at such a rate that freshly deposited concrete may be uniformly integrated and made homogeneous at all contact surfaces with preceding deposits of concrete which shall remain both plastic and properly workable by vibration.

1. Placement of concrete elements supported by columns, walls, piers and the like, shall not commence until the supporting concrete is no longer plastic and, in any event, not before a 4 hour waiting period is fully expired.
2. Concrete shall be deposited as near as practicable and possible to its final position in the structure. Placement procedures shall avoid segregation due to rehandling or due to the lateral flowing of concrete induced by gravity or by vertical dropping. To minimize segregation, concrete may not be dropped between reinforcing steel curtains and cages, nor through successive reinforcement grids. Without special acceptance, vertical free fall of concrete shall be limited to 4 feet (1200 mm).
3. Procedures which cause or contribute to excessive segregation of aggregates or cause non-uniform concrete mixtures shall not be used and will be rejected.

K. **Placement of Self-Consolidating Concrete:** See section *Placement of Concrete* above for additional requirements for self-consolidating concrete.

1. Self-consolidating concrete shall be placed by pump. Where shown in the drawings or noted in these specifications, self-consolidating concrete shall be pumped from the bottom of the formwork.
2. When pumping, self-consolidating concrete shall be used to prime the pump. The self-consolidating concrete used to prime the line shall not be placed in the work.
3. Self-consolidating concrete shall be deposited as near as practicable and possible to its final position in the structure and in no case shall exceed a maximum 30 feet of flowing distance.
4. Self-consolidating concrete shall not be allowed to free fall. The discharge point shall be fully submerged in the placed concrete.
5. Self-consolidating concrete should be poured continuously, without breaks, lifts, or construction joints.
6. Self-consolidating concrete shall not be vibrated.
7. When placing self-consolidating concrete around box-outs or other obstructions, ensure that concrete is placed from one side only and allowed to fill around the entire obstruction.

L. **Cold Joints** are defined as joints wherein concrete on one side has hardened sufficiently so that fresh concrete does not mix thoroughly with that concrete. Cold joints, should they occur, shall result in the immediate stoppage of all placement operations. Detailed drawings showing remedial measures, including removal of material, the drilling-in of dowels and anchors, the construction of keys and specially roughened construction joints by bush hammering and all else will be required prior to placing contiguous concrete.

M. **Layering:** Concrete may not be placed in layers exceeding 2 feet (600 mm) in depth. Each layer shall be vibrated to the extent necessary to remove voids, honeycombing and the like.

N. **Vibration:** In accordance with ACI 309R, with the exception of self-consolidating concrete shall be compacted thoroughly by vibrating to produce a dense, homogeneous mass without voids or pockets and shall be accomplished only by experienced operators. Internal vibrators shall be placed in the concrete vertically and shall penetrate at least 3 to 4 inches (75 to 100 mm) into the preceding lift in order to thoroughly blend adjacent layers. Work concrete thoroughly around waterstops and other embedded items.

1. Where vibrating concrete with epoxy coated reinforcement, provide vibrators with rubber covered heads and otherwise preclude damage to the epoxy coating.

3.10 OTHER CONCRETE WORK

A. **Cement Grout:**

1. Grout all elevator door sills and other items indicated in the Drawings. Grout openings in concrete around conduit, piping and other Work passing through concrete except where non-shrink grout is specified or shown. Mix, place and cure as provided by this Specification.
2. Drypack grout at beam pockets in concrete walls as shown in the Drawings. Pack grout solidly, fill entire area to be grouted, and provide complete bearing with no voids. Cure for seven days.

B. **Non-Shrink Grouting:** Provide formwork for grouting, install flowable non-shrink grout, cure, remove grout forms and seal and protect exposed grout edges, all in strict accord with the printed instructions of the grout manufacturer.

C. **Curbs:** Strip formwork while still green and steel-trowel surfaces to a hard, dense finish. Provide corners, intersections and terminations that are slightly rounded.

D. **Cement Bases** shall consist of one part Portland cement and 2 parts fine aggregate.

1. Clean and roughen backing, brush in pure cement grout, place with accurate screeds, trowel to a dense, smooth finish with a bullnosed top. Provide cove at intersections with floor.

3.11 CONCRETE FINISHES AND TREATMENTS

A. **General:** Bring surface to level with screeds and strike off. Smooth the resulting surface with bull floats or darbies to remove both high points and low points. Do not add water to or disturb the plastic surface prior to finishing. Accomplish all finishes in accord with ACI 301, except where more stringent requirements are given in this Specification.

1. Unless otherwise provided under this Specification, all flatwork shall receive a monolithic steel troweled concrete finish.
2. Where finished floor is located above the top of the structural slab, provide all required fill and cement finish required to bring floor to final grade or to underside of final finish, as appropriate.

B. **Screeding for Elevated Floor Surfaces:** The intent of this Specifications is to provide a slab which is screeded and finished so that the finished slab is horizontal (or sloped as given in the Drawings) and so that the slab thickness equals the thickness given in the Drawings, within the tolerances specified herein.

1. The act of striking off the surface of the concrete to a predetermined grade shall be accomplished with the aid of rigid screed guide. The use of wet screed guides is to be avoided on all elevated surfaces.
2. Set screeds so that slab surface is horizontal (or sloped as given in the Drawings).
3. Floor construction, including metal deck floor construction, may continue to deflect for a short period after strike off; subsequent restraightening of the surface may move concrete paste from over beams into the resulting depressions. Contractor should plan for sufficient initial slab thickness over beams to accommodate restraightening of the surface while still maintaining adequate concrete cover and minimum slab thickness over the beams.
4. Grade for initial strike off shall be established using grades required by the Contract Documents, making use of control points spaced at intervals not greater than 12 feet (3600 mm) in each direction.
5. Conformance of strike off to desired grade shall be confirmed during concrete placing operations at regular intervals after sufficient load has been applied to the supporting formwork to cause initial settlement to take place.
6. Elevation bench marks shall be provided at each column and wall element for use by the finishers as a guide when they are completing the finishing in these areas.
7. Steel and Precast Beams: All beams have some camber, natural or induced. Cambers will likely not be uniform from beam-to-beam. Contractor shall set the grade of screeds to achieve the minimum slab thickness, while maintaining levelness and flatness within the specified limits. Where required, the maximum slab thickness may exceed the specified limits.
8. Unshored Steel and Precast Beams: It is known that beams and girders will deflect under the weight of the fresh concrete. Beam cambers, if any, may not compensate for the actual beam and girder deflections. Contractor shall reset the grade of screeds so as to achieve the minimum slab thickness, while maintaining levelness and flatness within the specified limits.

C. **Flatwork Finishes:** Apply the following finish types as required by the Drawings and by this Specification:

1. Float Finish: Required for concrete flatwork surfaces which will receive trowel finish, roofing, waterproofing membrane, insulation, sand-bedded terrazzo and similar finishes, composition troweled floor finish, or "floating slabs". After the concrete has been placed, struck off, consolidated and leveled, the concrete shall not be worked further until ready for floating. Floating shall begin when the water sheen has disappeared and/or when the mix has stiffened sufficiently to permit the proper operation of a power-driven float. The surface shall then be consolidated with power-driven floats. Hand floating with wood or cork faced floats shall be used in locations inaccessible to the power-driven machine. Immediately after leveling, the surface shall be refloated to uniform, smooth, granular texture. Wet cure for seven days.

2. Troweled Finish: Required for all concrete flatwork surfaces which will be exposed, or which will receive resilient flooring, carpeting, thin-set floor covering, paint and other thin-film finishes, waterproofing and roofing systems, and any other floor covering requiring a smooth base slab. First, achieve a float finish, and then:
   a. After the concrete has been placed, struck off, consolidated, screeded and floated, and as soon as the condition of the slab permits, and before it has hardened appreciably, all water film and foreign material which may work to the surface shall be removed by means of lutes.
   b. Prior to removal of screed, the surface shall be checked for flatness and levelness, and filled or cut down where necessary. Rough finishing shall be repeated with straightedge and float.
   c. The surface shall be troweled at least twice to a smooth dense finish.
   d. The first troweling after power floating shall be done by a power trowel and shall produce a smooth surface which is relatively free of defects but which may still contain some trowel marks.
   e. Where required, additional troweling shall be done after the surface has hardened sufficiently. The finished surface shall be dense and smooth, free of any trowel marks, uniform in texture and appearance. On surfaces intended to receive floor covering, defects that would show through the floor covering shall be removed by grinding.
   f. Concrete surfaces to receive membrane waterproofing shall receive a trowel finish which leaves the surface smooth and dense, free of voids, projections or ridges.
   g. These surfaces shall be wet cured for seven days, unless a strippable curing compound is used.
3. Exposed Float Finish: Required for interior and exterior paving, where indicated in the Drawings, and for the tops of all exposed walls. Use "troweled finish" with a wood or cork float. Wet cure for seven days.
4. Exposed Broom Finish: Required for exterior paving surfaces and at other surfaces where indicated in the Drawings. Consult with Construction Manager and with Architect for texture and direction of texture at each area to receive broom finish. After floating use push broom with 1/16" (1.6 mm) diameter bristles. Brush consistently and continuously across each area designated, perpendicular to direction of traffic. Wet cure for seven days. Apply waterproofing and chloride ion screen.
5. Scratched Finish: Required for concrete flatwork surfaces which will receive concrete or cement fill or which will receive finish material which will be bonded with cement mortar. After the concrete has been placed, struck off, consolidated and leveled, the surface shall be roughened with stiff brushes or rakes before final set. Wet cure for seven days.

D. **Structural Repairs:** Conform to Section 5.3.7 of ACI 301, *Specifications for Structural Concrete*, and to accepted procedures. Use the specified polymer repair mortars and epoxy adhesives. Proposed structural repairs need be submitted and approved prior to performing the repair.

E. **Hole Cutting in Hardened Concrete:**

1. It is the intent of these Specifications that hole cutting in hardened concrete will not be required. In the event that hole cutting is required, Contractor shall prepare appropriate details and procedures to accomplish the work and shall submit such details and procedures for acceptance. Cutting holes in the hardened concrete shall conform strictly to accepted details and procedures.
2. Prior to cutting holes, use a pachometer to locate all potentially affected reinforcing bars, conduits and pipes. Perform coring to avoid touching, cutting or damaging existing reinforcement. Cut reinforcement or embedded items only in accord with accepted details and procedures.

3.12 CURING, SEALING,HARDENING, DENSIFYING AND PROTECTION

A. **Curing Formed Concrete:** Conform to all applicable recommendations of ACI 305, ACI 306, and ACI 308.

1. Protect newly placed concrete against rain wash, low and high temperature effects and against premature loss of moisture.
2. Heating of concrete for curing in cold weather shall be by means and methods which do not cause carbonization effects in the concrete. Erect wind breaks and weather protection when and where required.

B. **Wet Curing** shall be for at least seven days at a temperature of at least 50°F (10°C) by continuous fog spray, immersion in water-tight covering of polyethylene to retain moisture or other accepted means. Do not use chemical curing on surfaces to be wet cured without specific acceptance.

C. **Curing Compounds:** Concrete may be cured with the specified curing compound providing the following requirements can by met:

1. All exposed interior slabs, not receiving a liquid densifier, and troweled slabs receiving mastic applied adhesives shall be cured with the specified curing and sealing compound.
2. Strippable Curing Compound: All slabs, where indicated on the drawings or where approved, shall be cured with the specified strippable curing compound applied in strict accordance with the manufacturer's recommendation.
3. Compounds which diminish bond or adhesion of finish materials, topping slabs, mortars and the like to concrete surfaces shall not be used or shall be totally removed prior to installation of affected Work. Contractor shall coordinate respective subcontractors and shall be solely responsible to determine and to assure compatibility of curing compound with both concrete and with overlying materials.

D. **Polymer Repair Material for Leveling Low Spots** shall be mixed, applied, cured and finished in strict accordance with the recommendations and instructions of the manufacturer.

E. **Protection:** Protect concrete Work from overloading and from defacement of any nature during construction operations.

3.13 FORM REMOVAL AND RESHORING

A. **General:** Forms and/or shores and reshores shall be removed only after the supported concrete has achieved sufficient strength to allow the structure to support the weight of concrete plus all superimposed live loads and lateral forces including construction live loads to be placed thereon, without damage to the structure, overstress or excessive deflection. Contractor shall perform, at no expense to Owner, all tests and calculations needed to show when forms, formwork supports, shores and reshores can be removed without endangering the structure, subject to the following limitations:

B. **Vertical Forms** may be removed 24 hours after concrete is placed contingent upon concrete having been maintained throughout that period at temperatures in excess of 50°F (10°C), upon achieving concrete strength adequate for stripping, and provisional on the implementation of effective curing procedures.

C. **Soffit and Supporting Forms**: Where early form removal or reshore removal is proposed, Contractor shall provide concrete cylinders, field-cured in the same temperature and moisture environment as the concrete under consideration. Where field cured cylinders are used, Contractor shall be responsible for all costs of casting, curing, transporting and testing cylinders and reporting results promptly.

D. **Shoring and Reshoring:** Beam, joist and slab soffits, and other formwork supporting the weight of concrete may not be removed until concrete has attained 75 percent or more of its design compressive strength and heavy construction loads have been removed. Comply with ACI 347.

E. **Earth Retention Walls:** Do not backfill against walls until all Work is in place which braces both the top and the bottom of walls against lateral motion until concrete has attained its full design strength and until waterproofing, dampproofing and insulation is in place.

END OF SECTION 03 30 00

SECTION 03 33 00 - ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place architectural concrete including form facings, reinforcement accessories, concrete materials, concrete mixture design, placement procedures, and finishes.

B. Construct architectural concrete with the special care. Architectural Concrete surfaces shall be uniform texture and color throughout, free of stains, cold joints and honeycombing.

C. Related Requirements:

1. Section 03 30 00 “Cast in Place Concrete”

2. Section 07 92 00 "Joint Sealants" for elastomeric joint sealants in contraction and other joints in cast-in-place architectural concrete.

1.3 DEFINITIONS

A. Cast-in-Place Architectural Concrete: Formed concrete that is exposed to view on surfaces of completed structure or building and that requires special concrete materials, formwork, placement, or finishes to obtain specified architectural appearance.

B. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

C. Design Reference Sample: Sample designated by Architect in the Contract Documents that reflects acceptable surface quality and appearance of cast-in-place architectural concrete.

D. Reveal: Projection of coarse aggregate from matrix or mortar after completion of exposure operations.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place architectural concrete to attend, including the following:

   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Cast-in-place architectural concrete subcontractor.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Formwork Shop Drawings: Show formwork construction including form-facing joints, rustications, construction and contraction joints, form joint-sealant details, form tie locations and patterns, inserts and embedments, cutouts, cleanout panels, and other items that visually affect cast-in-place architectural concrete.

D. Placement Schedule: Submit concrete placement schedule before start of placement operations. Include locations of all joints including construction joints.

E. Samples: For each of the following materials:

1. Form-facing panel.
2. Form ties.
3. Form liners.
4. Coarse- and fine-aggregate gradations.
5. Chamfers and rustications.

F. Samples for Verification: Architectural concrete Samples, cast vertically, approximately 18 by 18 by 2 inches, of finishes, colors, and textures to match design reference sample. Include Sample sets showing the full range of variations expected in these characteristics.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Material Certificates: For each of the following:

1. Cementitious materials.
2. Admixtures.
3. Form materials and form-release agents.
4. Repair materials.

C. Material Test Reports: For the following, by a qualified testing agency:

1. Aggregates.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "NRMCA Quality Control Manual - Section 3, Certification of Ready Mixed Concrete Production Facilities."

B. Testing Agency Qualifications: Qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
2. Personnel performing laboratory tests shall be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

C. Source Limitations for Cast-in-Place Architectural Concrete: Obtain each color, size, type, and variety of concrete material and concrete mixture from single manufacturer with resources to provide cast-in-place architectural concrete of consistent quality in appearance and physical properties.

D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete
2. ACI 303.1, "Specification for Cast-in-Place Architectural Concrete."

E. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

F. Field Sample Panels: After approval of verification sample and before casting architectural concrete, produce field sample panels to demonstrate the approved range of selections made under Sample submittals. Produce a minimum of three sets of full-scale panels, cast vertically, approximately 48 by 48 by 6 inches minimum, to demonstrate the expected range of finish, color, and texture variations.

1. Locate panels as indicated or, if not indicated, as directed by Architect.
2. Demonstrate methods of curing, aggregate exposure, sealers, and coatings, as applicable.
3. In presence of Architect, damage part of an exposed-face surface for each finish, color, and texture, and demonstrate materials and techniques proposed for repair of tie holes and surface blemishes to match adjacent undamaged surfaces.
4. Maintain field sample panels during construction in an undisturbed condition as a standard for judging the completed Work.
5. Demolish and remove field sample panels when directed.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

A. General: Comply with Section 03 30 00 "Cast-in-Place Concrete" for formwork and other form-facing material requirements.

B. Form-Facing Panels for Finishes: Steel, glass-fiber-reinforced plastic, or other approved nonabsorptive panel materials that will provide continuous, true, and smooth architectural concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

C. Form-Facing Panels for Finishes: Exterior-grade plywood panels, nonabsorptive, that will provide continuous, true, and smooth architectural concrete surfaces.

D. Forms for Cylindrical Columns, Pedestals, and Supports: Metal, glass-fiber-reinforced plastic, paper, or fiber tubes that will provide surfaces with gradual or abrupt irregularities not exceeding specified formwork surface class. Provide units with sufficient wall thickness to resist plastic concrete loads without detrimental deformation.

E. Pan-Type Forms: Glass-fiber-reinforced plastic or formed steel, stiffened to resist plastic concrete loads without detrimental deformation.

F. Form Liners: Units of face design, texture, arrangement, and configuration indicated. Furnish with manufacturer's recommended liquid-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent surface treatments of concrete.

G. Rustication Strips: Metal, rigid plastic, or dressed wood with sides beveled and back kerfed; nonstaining; in longest practicable lengths.

H. Chamfer Strips: Metal, rigid plastic, elastomeric rubber, or dressed wood, 3/4 by 3/4 inch, minimum; nonstaining; in longest practicable lengths.

I. Form Joint Tape: Compressible foam tape; pressure sensitive; AAMA 800, "Specification 810.1, Expanded Cellular Glazing Tape"; minimum 1/4 inch thick.

J. Form Joint Sealant: Elastomeric sealant complying with ASTM C 920, Type M or Type S, Grade NS, that adheres to form joint substrates.

K. Sealer: Penetrating, clear, polyurethane wood form sealer formulated to reduce absorption of bleed water and prevent migration of set-retarding chemicals from wood.

L. Form-Release Agent: Commercially formulated, colorless form-release agent that will not bond with, stain, or adversely affect architectural concrete surfaces and will not impair subsequent treatments of those surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

M. Surface Retarder: Chemical liquid set retarder, for application on form-facing materials, capable of temporarily delaying final hardening of newly placed concrete surface to depth of reveal specified.

N. Form Ties: Factory-fabricated ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish ties that, when removed, will leave holes 3/4 inch (19 mm) in diameter on concrete surface.
2. Furnish internally disconnecting ties that will leave no metal closer than 1-1/2 inches (38 mm) from the architectural concrete surface.
3. Furnish glass-fiber-reinforced plastic ties, not less than 1/2 inch (13 mm) in diameter, of color selected by Architect from manufacturer's full range.
4. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT AND ACCESSORIES

A. General: Comply with Section 03 30 00 "Cast-in-Place Concrete" for steel reinforcement and other requirements for reinforcement accessories.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire fabric in place; manufacture according to CRSI's "Manual of Standard Practice."

2.3 CONCRETE MATERIALS

A. Cement: Portland Cement, Type I, II or III, of approved manufacturer, fresh stock, meeting requirement of ASTM C-150 or Type LH or GU meeting requirements of

ASTM C1157, except as modified below. Do not use Type III cement for concrete 2.5 feet thick or thicker.

B. Concrete Aggregates:

1. Fine and Coarse Aggregates for Normal Weight Concrete shall conform with ASTM C-33. Aggregates shall have hard, angular, uncoated durable particles and shall be free of injurious amounts of thick elongated pieces, mica, clay, silt and organic matter.

   a. Fine aggregate shall be natural sand or stone screenings.

   b. Coarse aggregate shall be crushed stone or gravel, meeting gradation requirements for size No. 67 (3/4 inch to No. 4) generally except as otherwise specified herein. Size No. 467 (1-1/2 inch to No. 4) may be used in concrete for footings, mats, pile caps and piers.

   c. Combined aggregate graduation for slabs and other designated concrete shall be 8%-18% for large top size aggregates (11/2) or 8%-22% for smaller top size aggregates (1" or ¾") retained on each sieve below the top size and above the No. 100.

   d. Where sharp corners are required in finished concrete work, use smaller size aggregate subject to the Architect's approval.

   e. Aggregates for the work will be acceptable on proof that their potential alkali reactivity is not deleterious to the concrete.

2. Coarse Aggregate for Structural Lightweight Concrete shall be an approved, uniformly graded, expanded shale of 3/4 inch maximum size, conforming to ASTM C-330, and must be free of impurities that will damage finishes or cause aggregate to separate at the surface of the concrete. Handle, store and pre-dampen lightweight aggregate as per manufacturer's recommendations before it is mixed with cement. Fine aggregate shall be natural sand or stone screenings, and shall conform to ASTM C33.

3. Use especially sound, durable aggregate for all concrete exposed to the weather in the completed project. Prior to construction obtain service records and test data, at the Contractor's expense, in writing for this aggregate and submit copies to the Architect. Test data shall comply with ASTM C-33 for aggregates for concrete, which will be subject to wetting or extended exposure and shall include the following:

   a. Deleterious substances including tests for material that could react harmfully with alkalis in the cement. Submit tests as per ASTM C-117, C-142, C-123, C40, C-289, and C-227.

   b. Soundness - submit tests as per ASTM C-88. Loss shall not exceed 8 percent if tested with sodium sulfate, 10 percent if tested with magnesium sulfate.

   c. Absorption Test as per ASTM C-127, C-128. Absorption of aggregates shall not exceed 1-1/2 percent unless Architect approves a higher absorption in writing.

d. The Architect may at his own discretion have the proposed concrete mix tested, at the Owner's expense, for resistance to freezing and thawing as per ASTM C291. The criterion of acceptability shall be a relative modulus of elasticity PC as per ASTM C-291, not less than 85 percent after 300 cycles of freezing and thawing. Size of test specimens as recommended in ASTM C-291.

4. Abrasive Aggregate shall be aluminum oxide grains, passing a No. 8 mesh screen and retained on a No. 30 mesh screen. Grains shall be well graded and bonded together.

C. Water: Potable, complying with ASTM C 94/C 94M except free of wash water from mixer washout operations.

2.4 ADMIXTURES

A. All admixtures are subject to the written approval of the Architect.

B. Air-Entraining Admixture: ASTM C 260.

C. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

D. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

1. Color: As selected by Architect from manufacturer's full range.

2.5 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) when dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

1. For integrally colored concrete, curing compound shall be approved by color pigment manufacturer.
2. For concrete indicated to be sealed, curing compound shall be compatible with sealer.

2.6 REPAIR MATERIALS

A. Bonding Agent: ASTM C 1059/C 1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

B. Epoxy Bonding Adhesive: ASTM C 881/C 881M, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements.

2.7 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of cast-in-place architectural concrete proportioned on basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed design mixtures based on laboratory trial mixtures.

B. Admixtures: Use admixtures according to manufacturer's written instructions.

C. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.8 CONCRETE MIXING

A. Architectural Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.

1. Clean equipment used to mix and deliver cast-in-place architectural concrete to prevent contamination from other concrete.
2. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. General: Comply with Section 03 30 00 "Cast-in-Place Concrete" for formwork, embedded items, and shoring and reshoring.

B. Limit deflection of form-facing panels to not exceed ACI 303.1 requirements.

C. Fabricate forms to result in cast-in-place architectural concrete that complies with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-in-place surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical. Kerf wood rustications, keyways, reglets, recesses, and the like, for easy removal.

1. Seal form joints and penetrations at form ties with form joint tape or form joint sealant to prevent cement paste leakage.
2. Do not use rust-stained steel form-facing material.

E. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

F. Chamfer exterior corners and edges of cast-in-place architectural concrete.

G. Coat contact surfaces of wood rustications and chamfer strips with sealer before placing reinforcement, anchoring devices, and embedded items.

H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

J. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

L. Coat contact surfaces of forms with surface retarder, according to manufacturer's written instructions, before placing reinforcement.

M. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and attach securely to prevent deflection and maintain stability of liners during concreting. Prevent form liners from sagging and stretching in hot weather. Seal joints of form liners and form liner accessories to prevent mortar leaks. Coat form liner with form-release agent.

3.2 REINFORCEMENT AND INSERTS

A. General: Comply with Section 03 30 00 "Cast-in-Place Concrete" for fabricating and installing steel reinforcement. Securely fasten steel reinforcement and wire ties against shifting during concrete placement.

B. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.3 REMOVING AND REUSING FORMS

A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

1. Schedule form removal to maintain surface appearance that matches approved mockups.
2. Cut off and grind glass-fiber-reinforced plastic form ties flush with surface of concrete.

B. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved 28-day design compressive strength. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

C. Clean and repair surfaces of forms to be reused in the Work. Do not use split, frayed, delaminated, or otherwise damaged form-facing material. Apply new form-release agent.

D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for cast-in-place architectural concrete surfaces.

3.4 JOINTS

A. Construction Joints: Install construction joints true to line with faces perpendicular to surface plane of cast-in-place architectural concrete so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated.
2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete. Align construction joint within rustications attached to form-facing material.
3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
6. Use bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

B. Contraction Joints: Form weakened-plane contraction joints true to line with faces perpendicular to surface plane of cast-in-place architectural concrete so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

3.5 CONCRETE QUALITY AND PROPORTIONING

A. Concrete shall be proportioned in accordance with ACI 211.1 and ACI 211.2. The mix design shall be prepared in accordance with Section 5.3 of ACI 318. The mix design shall be submitted for approval by the Structural Engineer of Record, together with data regarding cementitious materials, aggregates and admixtures, prior to the start of construction.

B. Water / Cementitious Materials Ratio: The maximum water/cementitious materials ratio shall be 0.45, however, architectural concrete and concrete exposed to the weather shall have a maximum water/cementitious materials ratio of 0.40. All concrete subject to freezing and thawing shall have a maximum water/cementitious materials ratio of 0.50 (4000 psi at 28 days or more). All concrete subjected to deicers and/or required to be watertight and architectural concrete shall have a maximum water/cementitious materials ratio of 0.45 (4500 psi at 28 days or more). All reinforced concrete subjected to brackish water, salt spray or deicers shall have a maximum water/cementitious materials ratio of 0.40(5000 psi at 28 days or more). All trowel finished interior slabs, subjected to vehicular traffic, shall have a maximum water/cementitious materials ratio of 0.53.

C. Slump: Concrete containing a high-range water-reducing admixture (Superplasticizer) shall have a maximum slump of 9” unless otherwise approved by the Engineer. The concrete shall arrive at the job site at a slump of 2” to 3”, (3” to 4” for concrete receiving a “shake-on” hardener or lightweight concrete), be verified, then the high-range water-reducing admixture added to increase the slump to the approved level. All other concrete shall have a maximum slump of 4”.

D. Air Content: All concrete exposed to freezing and thawing and/or required to be watertight shall have an air content of 4.5% to 7.5%.

E. If the proposed mix designs are based on trial mixes, the proposed mix shall provide a 1200-psi over-design in accordance with ACI 318. This over-design will be 1.10 F'c + 700 psi for concrete strengths in excess of 5000-psi.

A. Admixture Usage: All concrete must contain the specified water-reducing admixture or the specified high-range water reducing admixture superplasticizer). All concrete required to be air entrained shall contain an approval air-entraining admixture. All architectural concrete shall contain the specified high-range water-reducing admixture (superplasticizer).

B. Self-Consolidating concrete (SCC): All architectural concrete shall use self-consolidating concrete. Proper workability, pumpability, finish, and setting time of the proposed mix design must be verified with a successful test placement onsite. All self-consolidating concrete shall contain the specified high range water reducing admixture, and viscosity enhancing admixture, when and as required. The slump/flow shall be between 20"-30". The target slump/flow +2", shall be based on a successful placement onsite.

C. The concrete shall be of such consistency and composition that it can be worked into the corners and angles of the forms around the reinforcement without permitting the materials to segregate or free water to collect on the surface.

D. Consult with the manufacturer of the lightweight aggregate to establish the proportions of the mixture, including cement content, to produce the required strength and weight, but not less than required by the Building Code.

E. If, during the progress of the work, it is found difficult to consistently secure concrete of the desired workability, feasibility, setting time of required strength with the mix design furnished by the Contractor, the Engineer may order such changes in proportions of materials or admixtures, or both, as may be necessary to secure the specified concrete properties. Any changes so ordered shall be made at the Contractor's expense. The source of supply of the aggregate and cement shall not be changed during the course of the job without previous notice to the Architect, and the material from any new source shall be subject to acceptance or rejection as based on complete new sets of preliminary tests. All expenses in connection with such tests shall be borne by the Contractor.

F. Measure materials for concrete by weighing. Weigh each size of aggregate and the cement separately. Cement weight and water volume shall be accurate to within plus or minus one percent. Each size of aggregate weight shall be accurate within plus or minus two percent. Admixtures should be measured to within plus or minus 3 percent. Measure mixing water by volume. Use moisture meters to measure the moisture content of the aggregates. Make necessary adjustment to batch weights to compensate for variations in aggregate moisture before batching by protecting and properly draining aggregates, especially fine aggregate. Maintain a uniform stable moisture content in the fine aggregate not in excess of 6 percent.

3.5 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, form-release agent, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously between construction joints. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 303.1.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches (150 mm) into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. Do not permit vibrators to contact forms.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents.
4. Do not use chemical accelerators unless otherwise specified and approved in design mixtures.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.6 FINISHES, GENERAL

A. Architectural Concrete Finish: Match Architect's design reference sample, identified and described as indicated, to satisfaction of Architect.

B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces.

   1. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

C. Maintain uniformity of special finishes over construction joints unless otherwise indicated.

3.7 AS-CAST FORMED FINISHES

A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections exceeding specified limits on formed-surface irregularities.

B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Remove fins and other projections exceeding specified limits on formed-surface irregularities. Repair and patch tie holes and defects.

C. Rubbed Finish: Apply the following to smooth-form-finished as-cast concrete where indicated:

   1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.
   2. Grout-Cleaned Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes. Mix one part portland cement to one and one-half parts fine sand with a 1:1 mixture of bonding admixture and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match surrounding concrete. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap and keep surface damp by fog spray for at least 36 hours.
   3. Cork-Floated Finish: Wet concrete surfaces and apply a stiff grout. Mix one part portland cement and one part fine sand with a 1:1 mixture of bonding agent and water. Add white portland cement in amounts determined by trial patches so color of dry grout will match surrounding concrete. Compress grout into voids by grinding surface. In a swirling motion, finish surface with a cork float.

D. Form-Liner Finish: Produce a textured surface free of pockets, streaks, and honeycombs, and of uniform appearance, color, and texture.

3.8 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with ACI 301 for hot-weather protection during curing.

B. Begin curing cast-in-place architectural concrete immediately after removing forms from concrete. Cure according to ACI 308.1, by one or a combination of the following methods that will not mottle, discolor, or stain concrete:

1. Moisture Curing: Keep exposed surfaces of cast-in-place architectural concrete continuously moist for no fewer than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for no fewer than seven days. Immediately repair any holes or tears during curing period; use cover material and waterproof tape.
3. Curing Compound: Mist concrete surfaces with water. Apply curing compound uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.9 FIELD QUALITY CONTROL

A. General: Comply with field quality-control requirements in Section 033000 "Cast-in-Place Concrete."

3.10 REPAIRS, PROTECTION, AND CLEANING

A. Repair and cure damaged finished surfaces of cast-in-place architectural concrete when approved by Architect. Match repairs to color, texture, and uniformity of surrounding surfaces and to repairs on approved mockups.

1. Remove and replace cast-in-place architectural concrete that cannot be repaired and cured to Architect's approval.

B. Protect corners, edges, and surfaces of cast-in-place architectural concrete from damage; use guards and barricades.

C. Protect cast-in-place architectural concrete from staining, laitance, and contamination during remainder of construction period.

D. Clean cast-in-place architectural concrete surfaces after finish treatment to remove stains, markings, dust, and debris.

E. Wash and rinse surfaces according to concrete finish applicator's written instructions. Protect other Work from staining or damage due to cleaning operations.

1. Do not use cleaning materials or processes that could change the appearance of cast-in-place architectural concrete finishes.

3.11 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 03 33 00

SECTION 03 40 00 - PRECAST CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 specification sections apply to work of this section.

1.2 DESCRIPTION OF WORK:

A. Furnish and install precast concrete catch basins, sanitary sewer manholes and light pole bases..

1.3 QUALITY ASSURANCE:

A. Standards: Comply with standards specified herein.

B. Qualifications of Manufacturer: Demonstrate capability to make and provide the specified quality products by attestation of the Prestressed Concrete Institute under the Plant Certification Program.

C. Qualification of Installers: Demonstrate not less than two years successful experience in erection of items similar to those required for this work.

1.4 SUBMITTALS:

A. General: Comply with provisions of Section 01340.

B. Product Data: Within 45 calendar days after award of the Contract, submit:

1. Complete materials list of all items proposed to be furnished and installed under this section.

2. Manufacturer's specifications, data, and instructions for all manufactured materials and products.

3. Manufacturer's certifications and laboratory test reports as required.

4. Shop drawings showing complete information for the fabrication and installation of the work of this section, including, but not necessarily limited to:

a) Dimensions and cross-section; location, size and type of reinforcement, including special reinforcement and lifting devices necessary for handling and erection.

b) Installation procedure, sequence of installation, and all required handling equipment.

c) Layout, dimensions, and identification of each precast unit corresponding to the sequence and procedure of installation.

d) Welded connections, indicated by AWS standard symbols.

e) Detail inserts, connections, and joints, including accessories and construction at openings in precast units.

f) Location and details of anchorage devices that are to be embedded in other construction.

1.5 PRODUCT HANDLING:

A. Delivery, Storage and Handling: Deliver the work of this section to the job site in such quantities and at such times as to assure the continuity of the installation. Store units at the job site in a manner to prevent cracking, distortion, warping, staining, and other physical damage, and in a manner to keep all markings visible. Lift and support points as shown on the approved shop drawings.

B. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the work and materials of all other trades.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the Owner.

1.6 PRODUCTS:

A. Design:

1. General: The pertinent design as shown on the drawings is considered satisfactory for cast-in-place concrete, but does not provide stresses incurred in factory precasting, transporting and erecting.

2. Standards:

a) Design in accordance with all pertinent recommendations contained in:
ACI 301
ACI 304
ACI 311

ACI 318
ACI 347
CRSI "Manual of Standard Practice"
PCI 116

b) Comply with building code requirements which are more stringent than above.

c) In the event of conflict, the more stringent provisions shall govern.

1.7 REINFORCEMENT AND CONNECTION MATERIALS:

A. General: Provide all reinforcements, accessory, and connection materials in accordance with the final design as approved by the Engineer.

1. Reinforcing Bars: ASTM A 651, Grade 60, deformed.

2. Welded Wire Fabric: ASTM A 185, welded wire fabric.

B. Standards:

1. All materials provided under this section shall meet or exceed the quality specified for similar materials under other sections of these specifications.

2. Those materials not specified under other sections, but required for a complete and proper installation, shall be new, first quality of their respective kinds, and as selected by the Contractor subject to the approval of the Engineer.

1.8 CONCRETE

A. Design Mixes: Prepare design mixes for each type of concrete required, and secure the Engineer's approval of the proposed design.

1. Design mixes shall be prepared either by an independent testing facility approved by the Engineer or by qualified precast manufacturing plant personnel approved by the Engineer.

2. Proportion mixes either by laboratory trial batch or field experience methods, using materials to be employed on the work for each type of concrete required, and complying with ACI 211.1.

B. Design Strength: Design the mix and proportion the concrete to attain a minimum compressive strength of 4000 psi when cured and tested at 28 days in accordance with ASTM C33.

1.9 FABRICATION:

A. General: Fabricate the work of this section to the sizes and shapes indicated, and of texture matching the approved samples:

1. Finished units shall be straight, true to size and shape, and within the specified casting tolerances.

2. Exposed edges shall be sharp, straight, and square; and all flat surfaces shall be in a true plane.

3. Warped, cracked, broken, spalled, stained, and otherwise defective units will not be acceptable.

4. Place and secure in the forms all anchors, clips inserts, reglets, lifting devices, stud bolts, shear ties, and other devices required for handling and installing the precast units, and for attachment of subsequent items as indicated or specified.

B. Curing: Form cure the work of this section for a minimum of 20 hours. Keep wet continuously for not less than six days after being removed from the forms. Following this curing period, allow the units to air dry for at least four days before being erected.

C. Casting Tolerances: Maintain casting, bowing, warping, and dimension tolerances within the following maximums:

1. Overall dimension for height and width of units shall be plus zero of unit dimension to minus 2.38 mm (3/32") for 3 m (10'-0") and over.

2. Thickness of units shall be plus or minus 3.17 mm (1/8") maximum.

3. Bowing or warping shall not exceed 1/360 of the span.

4. Insert locations shall be within plus or minus 6.35 mm (1/4") in each direction.

5. Opening dimensions to figured dimensions shall be within a tolerance of plus 3/17 mm (1/8") to minus zero.

1.10 SURFACE FINISH:

A. General: Surface finishes are called for on the drawings by the "type" described below:

B. Finish Type "A": Standard finish; use where called for on the drawings and wherever no other finish is called for. Normal plant-run finish produced by forms that impart a smooth finish to the concrete. Small surface holes caused by air bubbles, normal form joint marks, and minor chips and spalls will be tolerated, but not major unsightly imperfections, honeycomb, or structural defects will be permitted.

C. Other Materials: All other materials, not specifically described but required for a complete and proper installation shall be as selected by the Contractor subject to the approval of the Engineer.

1.11 EXECUTION:

A. Inspection:

1. Examine the areas and conditions under which work of this section will be installed. Correct conditions detrimental to proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

B. Coordination:

1. Throughout progress of the work, coordinate as required with all other trades to ensure that proper and adequate interface is provided to receive the work of this section.

C. Installation:

1. General: Install the work of this section in strict accordance with the approved shop drawings, the original design, and all pertinent codes and regulations.

END OF SECTION

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SECTION 03 45 00 - PRECAST ARCHITECTURAL CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Precast architectural concrete units.
2. Grout materials.

B. Related Requirements:

1. Section 085113 "Aluminum Windows" for windows set into architectural precast concrete units.

1.2 DEFINITIONS

A. Design Reference Sample: Sample of approved architectural precast concrete color, finish, and texture, preapproved by Architect

1.3 ACTION SUBMITTALS

A. Product Data:

1. Precast architectural concrete unit design mixtures: Include compressive strength and water-absorption tests for each precast concrete mixture.
2. Grout materials.

B. Shop Drawings:

1. Detail fabrication and installation of architectural precast concrete units.
2. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit.
3. Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.
4. Indicate details at building corners.
5. Indicate separate face and backup mixture locations and thicknesses.
6. Indicate type, size, and length of welded connections by AWS standard symbols. Detail loose and cast-in hardware and connections.
7. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to structure or other construction.
8. Indicate locations, extent, and treatment of dry joints if two-stage casting is proposed.
9. Include plans and elevations showing unit locations, dimensions, erection sequences, and bracing plans for special conditions.
10. Indicate location of each architectural precast concrete unit by same identification mark placed on panel.
11. Indicate relationship of architectural precast concrete units to adjacent materials.

12. Indicate locations, type, dimensions, and details of facing units, including corner units, special shapes, joint treatment, and anchors.
13. Indicate multiple wythe connection details.
14. Coordinate and indicate openings and inserts required by other trades.
15. If design modifications are proposed to meet performance requirements and field conditions, submit design calculations and indicate modified areas on Shop Drawings. Do not adversely affect the appearance, durability, or strength of units.

C. Samples: Design reference samples for initial verification of design intent, for each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of three, representative of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches.

1. When other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.
2. Samples for each stone veneer unit required, showing full range of color and texture expected. Include Sample showing color and texture of joint treatment.
   a. Grout Samples for Initial Selection: Color charts consisting of actual sections of grout showing manufacturer's full range of colors.
   b. Grout Samples for Verification: Showing color and texture of joint treatment.

D. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of two sample panels approximately 1 sq. ft. in area for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.

1. Locate panels where indicated or, if not indicated, as directed by Architect.
2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
3. After acceptance of repair technique, maintain one sample panel at manufacturer's plant and one at Project site in an undisturbed condition as a standard for judging the completed Work.
4. Demolish and remove sample panels when directed.

E. Range Samples: After sample panel approval and before fabricating architectural precast concrete units, produce a minimum of two sets of samples, approximately 1 sq. in area, representing anticipated range of each color and texture on Project's units. Maintain one set of range samples at Project site and remaining sets at manufacturer's plant as color and texture approval reference.

F. Delegated Design Submittals: For architectural precast concrete indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Show governing panel types, connections, types of reinforcement, including special reinforcement, and concrete cover on reinforcement. Indicate location, type, magnitude, and direction of loads imposed on the building structural frame from architectural precast concrete.

1.4 CLOSEOUT SUBMITTALS

A. General Contractor/Construction Manager Project Survey: Complete the survey form, providing feedback of the certified precast producer's performance in accordance with PCI's Architectural Certification Program. Submit to PCI as directed on form; provide a copy to Architect.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

1. Designated as an APA-certified plant for production of architectural precast concrete products.
2. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 135.

B. Certified Installer Qualifications: A precast concrete erector qualified and designated by PCI's Certificate of Compliance to erect Category A (Architectural Systems) for nonload-bearing members.

C. Installer Qualifications: A precast concrete erector who has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project in same category as this Project and who can produce an Erectors' Post-Audit Declaration.

D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

E. Delegated Design Engineer Qualifications: A professional engineer who is legally qualified to practice in [state] <Insert jurisdiction> where Project is located and who is experienced in providing engineering services of the type indicated.

F. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:

1. AWS D1.1/D1.1M.
2. AWS D1.4/D1.4M.
3. AWS D1.6/D1.6M.

1.6 MOCKUPS

A. Build mockups to verify selections made under Sample submittals.

1. After sample panel and range sample approval, build mockup, complete with anchors, connections, flashings, and joint fillers.
   a. Build preconstruction testing mockup at testing agency facility.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner specifically approves such deviations by Change Order.

3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on mockups.

1. 10’-8” X 4”
2. Provide test specimens and assemblies representative of proposed materials and construction.
3. Perform preconstruction testing in accordance with ASTM C1354/C1354M or ASTM E488/E488M, modified as follows:
   a. Anchorage Tests: Test 12-inch- square samples for stone variety, orientation of cut, finish, and anchor type proposed for use on Project. Test for shear and tensile strength of anchorage system.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground or other rehandling.

B. Support units during shipment on nonstaining shock-absorbing material.

C. Store units with adequate dunnage and bracing, and protect units to prevent contact with soil, prevent staining, and prevent cracking, distortion, warping, or other physical damage.

D. Place stored units so identification marks are clearly visible, and units can be inspected.

E. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.

F. Lift and support units only at designated points indicated on Shop Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design architectural precast concrete units.

B. Design Standards: Comply with ACI 318 and design recommendations of PCI MNL 120 applicable to types of architectural precast concrete units indicated.

C. Calculated Fire-Test-Response Characteristics: Provide architectural precast concrete units with fire-resistance rating indicated as calculated in accordance with [ACI/TMS 216.1/216.1M)] [PCI 124] and acceptable to authorities having jurisdiction.

2.2 PRECAST ARCHITECTURAL CONCRETE UNITS

A. Provide unit types as indicated on Drawings, including window sill.

B. Fabricators: Subject to compliance with requirements, provide products by the following:

1. Precast Concrete Window Sill.

C. Source Limitations: Obtain precast architectural concrete units from single fabricator.

2.3 GROUT MATERIALS

A. Sand-Cement Grout: Portland cement, ASTM C150/C150M, Type I, and clean, natural sand, ASTM C144 or ASTM C404. Mix at ratio of 1 part cement to 2-1/2 to 3 parts sand, by volume, with minimum water required for placement and hydration. Water-soluble chloride ion content is to be less than 0.06 percent by weight of cement when tested in accordance with ASTM C1218/C1218M.

B. Nonmetallic, Nonshrink Grout: Packaged, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, plasticizing and water-reducing agents, complying with ASTM C1107/C1107M, Grade A for dry pack and Grades B and C for flowable grout, and of consistency suitable for application within a 30-minute working time. Water-soluble chloride ion content is to be less than 0.06 percent by weight of cement when tested in accordance with ASTM C1218/C1218M.

C. Epoxy-Resin Grout: Two-component, mineral-filled epoxy resin; ASTM C881/C881M, of type, grade, and class to suit requirements.

2.4 FINISHES

A. Exposed faces to be free of joint marks, grain, and other obvious defects. Corners, including false joints to be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved [design reference sample] [sample panels] [mockups] and as follows:

1. PCI's "Architectural Precast Concrete - Color and Texture Selection Guide," of plate numbers indicated.
2. Polished Finish: Use continuous mechanical abrasion with fine grit, followed by filling and rubbing procedures.

B. Finish exposed back surfaces of architectural precast concrete units to match face-surface finish.

C. Finish unexposed surfaces of architectural precast concrete units with as-cast finish.

2.5 SOURCE QUALITY CONTROL

A. Quality-Control Testing: Test and inspect precast concrete in accordance with PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect in accordance with PCI TR-6, ASTM C1610/C1610M, ASTM C1611/C1611M, ASTM C1621/C1621M, and ASTM C1712.

B. Owner will employ an independent testing agency to evaluate architectural precast concrete fabricator's quality-control and testing methods.

   1. Allow Owner's testing agency access to material storage areas, concrete production equipment, concrete placement, and curing facilities. Cooperate with Owner's testing agency and provide samples of materials and concrete mixtures as may be requested for additional testing and evaluation.

C. Strength of precast concrete units is considered deficient if units fail to comply with ACI 318 requirements for concrete strength.

D. Testing: Fabricator will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength in accordance with ASTM C42/C42M and ACI 318.

   1. A minimum of three representative cores to be taken from units of suspect strength, from locations directed by Architect.
   2. Test cores in an air-dry condition.
   3. Strength of concrete for each series of three cores is considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
   4. Report test results in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports include the following:
      a. Project identification name and number.
      b. Date when tests were performed.
      c. Name of precast concrete fabricator.
      d. Name of concrete testing agency.
      e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.

E. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.

F. Defective Units: Discard and replace recast architectural concrete units that do not comply with acceptability requirements in PCI MNL 117, including concrete strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups. Replace unacceptable units with precast concrete units that comply with requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting performance of the Work.

B. Do not install precast concrete units until supporting cast-in-place concrete has attained minimum allowable design compressive strength and supporting steel or other structure is structurally ready to receive loads from precast concrete units.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION OF PRECAST ARCHITECTURAL CONCRETE UNITS

A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.

B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment of units until permanent connections are completed.

1. Install temporary steel or plastic spacing shims as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
4. Unless otherwise indicated, maintain uniform joint widths of 3/4 inch.

C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.

1. Do not permit connections to disrupt continuity of roof flashing.

D. Welding: Comply with applicable requirements in AWS D1.1/D1.1M and AWS D1.4/D1.4M for welding, welding electrodes, appearance, quality of welds, and methods used in correcting welding work.

1. Protect architectural precast concrete units and bearing pads from damage by field welding or cutting operations, and provide noncombustible shields as required.
2. Welds not specified to be continuous fillet welds use no less than the minimum fillet as specified by AWS.
3. Clean weld-affected metal surfaces with chipping hammer followed by brushing, and apply a minimum 4.0-mil- thick coat of galvanized repair paint to galvanized surfaces in accordance with ASTM A780/A780M.
4. Visually inspect welds and remove, reweld, or repair incomplete and defective welds.

E. At bolted connections, use lock washers, tack welding, or other approved means to prevent loosening of nuts after final adjustment.

1. Where slotted connections are used, verify bolt position and tightness. For sliding connections, properly secure bolt but allow bolt to move within connection slot.
2. For slip-critical connections, use one of the following methods to assure proper bolt pretension:

a. Turn-of-Nut: In accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
b. Calibrated Wrench: In accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
c. Twist-off Tension Control Bolt: ASTM F3125/F3125M, Grade 1852.
d. Direct-Tension Control Bolt: ASTM F3125/F3125M, Grade 1852.

3. For slip-critical connections, use method and inspection procedure approved by Architect and coordinated with inspection agency.

F. Grouting or Dry Packing Connections and Joints: Grout connections where required or indicated. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry pack grout material, tamping until voids are completely filled. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens. Keep grouted joints damp for not less than 24 hours after initial set.

3.3 ERECTION TOLERANCES

A. Erect architectural precast concrete units level, plumb, square, and in alignment without exceeding the noncumulative erection tolerances of PCI MNL 135.

B. Erect architectural precast concrete units level, plumb, square, and in alignment, without exceeding the following noncumulative erection tolerances:

1. Plan Location from Building Grid Datum: Plus or minus 1/2 inch.
2. Plan Location from Centerline of Steel: Plus or minus 1/2 inch.
3. Top Elevation from Nominal Top Elevation: As follows:
   a. Exposed Individual Panel: Plus or minus 1/4 inch.
   b. Nonexposed Individual Panel: Plus or minus 1/2 inch.

4. Support Elevation from Nominal Support Elevation: As follows:
   a. Maximum Low: 1/2 inch.
   b. Maximum High: 1/4 inch.

5. Maximum Plumb Variation over the Lesser of Height of Structure or 100 ft. (30 m): 1 inch.
6. Plumb in Any 10 ft. (3 m) of Unit Height: 1/4 inch, additionally a maximum of 1/2 inch over total height of the unit.
7. Maximum Jog in Alignment of Matching Edges: 1/4 inch.
   a. Exposed Panel Relative to Adjacent Panel: 1/4 inch.
   b. Nonexposed Panel Relative to Adjacent Panel: 1/2 inch.
   c. Add 1/8-inch additional tolerance in the maximum jog for panels larger than 20 ft. per 10 ft. of additional height, up to a maximum tolerance of 1/2 inch.

8. Joint Width (Governs over Joint Taper): Plus or minus 3/16 inch for joints 10 ft. or less in length, plus or minus 1/4 inch for joints over 10 ft. in length.
9. Maximum Joint Taper: Plus or minus 3/16 inch for joints 10 ft. or less in length; plus or minus 1/4 inch for joints over 10 ft. in length.
10. Joint Taper in 10 ft. (3 m): 1/4 inch.
11. Maximum Jog in Alignment of Matching Faces: 1/4 inch.

12. Differential Bowing or Camber, as Erected, between Adjacent Members of Same Design: 1/4 inch.
13. Opening Height between Spandrels: Plus or minus 1/4 inch.

3.4 REPAIR

A. Repair architectural precast concrete units if permitted by Architect. Architect reserves the right to reject repaired units that do not comply with requirements.

B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 ft..

C. Prepare and repair damaged galvanized coatings with galvanizing repair paint in accordance with ASTM A780/A780M.

D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.

E. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Erection of loadbearing precast concrete members.
2. Visually inspect field welds and test in accordance with ASTM E165/E165M or to ASTM E709 and ASTM E1444/E1444M.
3. High-strength bolted connections are subject to inspections.

C. Prepare test and inspection reports.

D. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, to be performed to determine compliance of replaced or additional work with specified requirements.

3.6 CLEANING

A. Clean surfaces of precast concrete units exposed to view.

B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.

C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.

1. Perform cleaning procedures, if necessary, in accordance with precast concrete fabricator's recommendations. Protect other work from staining or damage due to cleaning operations.
2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 03 45 00

SECTION 03 54 00 - SELF-LEVELING TOPPINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 General Requirments, apply to this Section.

1.2 SUMMARY

A. This Section includes floor patching / leveling over existing substrates to provide a smooth floor surface on interior surfaces only.

1.3 REFERENCES

A. ASTM C 109M, Compressive Strength Air-Cure Only

B. ASTM C348, Flexural Strength of Hydraulic-Cement Mortars

C. ASTM E84, Surface Burning Characteristics of Building Materials

D. ASTM F2170, Relative Humidity in Concrete Floor Slabs Using in situ Probes

E. ASTM F1869, Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium
Chloride

F. ASTM 710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring

1.4 SUBMITTALS

A. Furnish product data, samples, laboratory test reports, and materials certificates as specified in Section "Resilient Tile Flooring."

1.5 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301.

B. Maintain copy of manufacturer's installation instructions on site, with criteria for preparation and application.

PART 2 - PRODUCTS

3.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering pre-packaged topping mixes that may be incorporated in the Work include, but are not limited to, the following:

1. K-15, Ardex Inc.
2. Mapei Novaplan II .
3. Other products equal to above.

B. Design mix to produce topping material with the following characteristics:

1. Compressive strength: Minimum 4000 psi at 28 days.

C. Absolutely no gypsum based products will be allowed on the project.

3.2 MIXING

A. Site-mix per-packaged materials in accordance with manufacturer's instructions.

B. Mix to a consistency to achieve self-leveling.

C. Do not add water unless otherwise instructed, in writing, in the manufacturer's installation instructions and approved by the Architect.

D. Do not add additional aggregate unless otherwise instructed, in writing, in the manufacturer's installation instructions for extending.

PART 3 - EXECUTION

3.1 CONDITION OF SURFACES

A. Topping Applied to Hardened Concrete: Remove exiting floor finishes as required. Remove dirt, loose material, oil, grease, paint, or other contaminants, leaving a clean surface. Remove high points and projections from concrete.

B. Non-porous subfloors such as ceramic and quarry tile as well as terrazzo should be clean and free of all waxes and sealers.

C. Joints: Mark locations of joints in base slab so that joints in top course will be placed directly over them.

3.2 PLACING AND FINISHING

A. Apply products in accordance with manufacturer's instructions on floor surfaces. Do not proceed with installation until unsatisfactory conditions are corrected. Screed level in accordance with following tolerances:

1. Tolerances: Maximum variation of surface flatness shall not exceed 1/8 inch in 10 feet.

B. Steel trowel any surfaces which are scheduled to receive ceramic tile or to be exposed.

C. Coordinate installation with adjacent work to ensure proper sequence of construction. Protect adjacent areas from contact due to mixing and handling of materials.

3.3 CURING AND PROTECTION

A. Cure and protect topping applications and finishes in accordance with manufacturer's recommendations.

3.4 PERFORMANCE

A. Failure of concrete topping to bond to substrate (as evidenced by a hollow sound when tapped), or disintegration or other failure of topping to perform as a floor finish, will be considered failure of materials and workmanship. Repair or replace toppings in areas of such failures, as directed.

3.5 WASTE MANAGEMENT

A. Coordinate with Section 017423.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 03 54 00

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SECTION 03 73 30 – CONCRETE REPAIR WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
   1. Division 3

1.2 SUMMARY

A. Provide labor, materials, equipment, and services to provide for the repair of concrete members with manufactured repair concrete/mortar as specified herein. Work includes removing spalled concrete and cleaning and coating of exposed steel reinforcement.

1.3 REFERENCES

A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated by governing codes or regulations, the recommendations, suggestions, and requirements described in the referenced standards shall be deemed mandatory and applicable to the Work
   1. American Society of Testing and Materials (ASTM)
   2. Steel Structures Painting Council (SSPC)
      a. Hand Tool Cleaning - SP2
      b. Power Tool Cleaning – SP3
   3. International Concrete Restoration Institute (ICRI)

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Provide manufacturer's information on the anti-corrosion coating and repair concrete/mortar, including application instructions and specifications.

1.5 QUALITY ASSURANCE

A. Manufacturer: Company specializing in the manufacture of concrete repair mortars to be used in this Contract shall have a minimum of ten years experience.

1.6 DELIVERY, STORAGE AND HANDLING

A. Materials specified shall be delivered to the site in sealed, properly labeled containers. Containers shall indicate manufacturer's name, trade name of product, lot number, shelf life of product, and mix ratio (if applicable).

B. Keep containers tightly closed when not in use. Comply with manufacturer's printed instructions for storing and protecting materials.

C. Do not store liquid material in hot sun. Keep material from freezing.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Do not apply if the temperature is below 50°F or above 85°F unless the material manufacturer is consulted for recommendations.

B. Do not use frozen materials or materials coated with ice or frost.

C. Do not apply when there is expectation of rain within 24 hours.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Sika Corp, Lyndhurst, NJ 07071

B. Strongwall Industries, Ridgewood, NJ 07451

C. Mapei Corp, Deerfiled Beach, FL 33442

2.2 MATERIALS

A. Repair Concrete - Non-formed Application

1. Shall have non-shrink characteristics and be of high compressive and bond strength. Material shall be non-sag, capable of being troweled in place for vertical and overhead applications without the need of formwork and conform to the following properties:

   a. Compressive strength of 5000 psi in 28 days when tested in accordance with ASTM C109.
   b. Bond strength of 1700 psi in 28 days when tested in accordance with ASTM C882 (modified). Results of tests showing failure of base material is acceptable alternative.

c. Flexural strength of 1100 psi in 28 days when tested in accordance with ASTM C78 or ASTM C293 or 1400 psi when tested in accordance with ASTM C348.
d. Maximum linear length change shall be 0.080% when tested in accordance with ASTM C157 (dry cure).
e. Modulus of elasticity shall be between 3.0 and 3.5 x 10^6 when tested in accordance with ASTM C469.

2. Repair concrete/mortar shall be:

a. Sikatop 123 Plus as manufactured by Sika.
b. SWI-88 as manufactured by Strongwall Industries.
c. Planitop 23 by Mapei.

B. Anti-corrosion Coating

1. Corrosion-inhibiting, epoxy/acrylic resin, protective coating for steel reinforcing bars that will not form a vapor barrier or bond break with the repair mortar with the following properties:

a. Bond strength of 1500 psi in 2 hours when tested in accordance with ASTM C882.
b. Flexural strength of 2000 psi in 28 days when tested in accordance with ASTM C78.
c. Tensile strength of 800 psi in 28 days when tested in accordance with ASTM C190.

2. Anti-corrosion coating shall be:

a. Armatec 110 as manufactured by Sika.
b. Planibond 3C by Mapei.

C. Miscellaneous Materials

1. Water: Potable water, ASTM C94
a.. J hooks: 1/4" diameter threaded rod, Type 316 stainless steel

2. Epoxy paste adhesive: ASTM C882
a. Coarse aggregate: Clean, washed crushed stone, 3/8" maximum size, conforming to ASTM C33.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine all adjoining work on which this Work is in anyway dependent for proper installation and workmanship. Report any conditions that prevent the performance of this Work.

3.2 PREPARATION AND PROTECTION

A. Protect adjacent surfaces not to be restored. Protect sills, ledges, and projections from material droppings.

B. Surface Preparation

1. Remove spalled and weak concrete and remove all loose and foreign material. Chip substrate by bush hammering or other mechanical means acceptable to the repair concrete/mortar manufacturer to obtain a minimum aggregate-fractured surface profile of 1/8±" conforming to an ICRI CSP 7 or greater surface preparation. Minimum depth of repair shall be 1/2", with the perimeter of the repair having a minimum of 1/8" in depth. Feather edging is not permitted.

2. If steel reinforcing is exposed, chip out behind the reinforcing steel. Chip a minimum of 1/2" behind the bar and 3" past the point where the bar is exposed. Concrete behind bars shall be removed enough to allow for the entire circumference of the bar to be cleaned. Remove concrete to the point past where sound material begins.

3. Exposed steel reinforcement and steel beams shall be free of all rust, scale, oil, paint, grease, loose mill scale, and all other foreign matter that will prevent bonding with the repair concrete. Use power chipping or power driven brushes and clean to an SSPC-SP2 or SP3 surface preparation.

4. Where additional reinforcement is not shown to be anchored in and for patches greater than $1^1/_2$" in depth and overhead patches, install stainless steel threaded J hooks set in epoxy paste adhesive. Anchor is to be 3/4" clear minimum from finished face of repair. Hooks are to be embedded a minimum of 3" into concrete, installed diagonally to plane of concrete surface. Holes are to drilled 1/8" larger than rod diameter and shall be cleaned thoroughly. Space hooks at 16" o.c.

3.3 ANTI-CORROSION COATING APPLICATION

A. Mix anti-corrosion coating in accordance with manufacturer's instructions. Apply to dry reinforcing steel using a stiff bristle brush. Brush in well to ensure continuous coverage. Apply in two coats of approximately 10 mils each or as per manufacturer's latest recommendations.

B. Protect coated steel from weather and allow to dry a minimum of 30-45 minutes between coats or repair concrete/mortar application. However, apply repair material within 20 hours after last coating. If 20 hour period elapses, reapply bonding agent and allow to dry as above.

3.1 REPAIR CONCRETE/ MORTAR APPLICATION

A. Mix structural repair concrete in accordance with manufacturer's instruction. Follow time limits set by manufacturer to prevent hardening of material prior to placement. For material requiring extension with aggregate due to depth of repair, provide 3/8" aggregate of proportions specified by the repair mortar manufacturer.

B. Prior to application of material, thoroughly saturate surface with water. Remove any standing water prior to patching.

C. Apply a scrub coat of the repair material of proportions determined by manufacturer (indicate in written repair procedure). While still damp, apply repair concrete/mortar.

D. Apply material behind and around rebars first to completely fill void.

3.2 PROTECTION AND CLEANING

A. Clean all adjacent areas of excess material and clean all floors and walls of powder and droppings. Remove misplaced materials from surfaces immediately.

B. Protect material from freezing and from rainfall prior to final set.

END OF SECTION 03 73 30

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SECTION 04 01 20 - MAINTENANCE AND RESTORATION OF BRICK MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work of this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all maintenance and restoration of unit masonry consisting of brick masonry restoration, re-pointing and cleaning as required by this section, schedules, keynotes and drawings, including, but not limited to the following:

1. Unused anchor removal.
2. Repair cracked brickwork in which cracks extend more than three courses by removing cracked brick, all mortar from around cracked brick, and mortar from joints in which mortar is cracked and providing salvaged brick set in new mortar.
3. Repair cracked brickwork in which cracks extend no more than three courses by filling cracks with composite patching mortar.
4. Painting steel uncovered during the work.
5. Restoration mortars and re-pointing joints.
6. Rake cracks through mortal' joints and brick units and provide sealant.
7. Preliminary cleaning, including removing plant growth.
8. Anti-graffiti coating.
9. Cleaning exposed unit masonry surfaces.

B. Related Sections:
1. Division 04 Section “Restoration Mortars.”
2. Division 07 Section “Joint Sealants.”

1.3 DEFINITIONS

A. Very Low-Pressure Spray: Under 100 psi.

B. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

C. Medium-Pressure Spray: 400 to 800 psi; 4 to 6 gpm.

D. High-Pressure Spray: 800 to 1200 psi; 4 to 6 gpm.

E. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.

B. Shop Drawings: For the following:

1. Provisions for expansion joints or other sealant joints.
2. Provisions for flashing, lighting fixtures, conduits, and weep holes as required.
3. Replacement and repair anchors. Include details of anchors within individual masonry units, with locations of anchors and dimensions of holes and recesses in units required for anchors.

C. Samples for Initial Selection: For the following:

1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by 1/4 inch wide, set in aluminum or plastic channels.
   a. Submit with precise measurements on ingredients, proportions, gradations, and sources of colored sands from which each Sample was made.
2. Patching Compound: Submit sets of patching compound Samples in the form of plugs (patches in drilled holes) in sample units of masonry representative of the range of masonry colors on the building.
3. Sealant Materials: See Division 07 Section "Joint Sealants."
4. Include similar Samples of accessories involving color selection.

D. Samples for Verification: For the following:

1. Each type of sand used for pointing mortar; minimum 1 lb of each in plastic screw-top jars.
   a. For blended sands, provide Samples of each component and blend.
   b. Identify sources, both supplier and quarry, of each type of sand.
2. Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches long by 3/8” wide, set in aluminum or plastic channels.
   a. Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.
3. Each type of masonry patching compound in the form of briquettes, at least 3 inches long by 1-1/2 inches wide. Document each Sample with manufacturer and stock number or other information necessary to order additional material.
4. Sealant Materials: See Division 07 Section "Joint Sealants."
5. Accessories: Each type of anchor, accessory, and miscellaneous support.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Qualification data for firm and personnel specified in "Quality Assurance" Article that demonstrates that both firm and personnel have capabilities and experience complying with requirements specified. For firm and foreman, provide a list of at least five completed projects similar in size and scope to the work required on this Project. For each project list project name, address, architect, conservator (if applicable), scope of contractor's work, and other relevant information. Submit this information with the bid.

B. Quality-Control Program.

C. Restoration Program.

D. Cleaning Program.

1.6 QUALITY ASSURANCE

A. Restoration Specialist Qualifications: Award brick masonry restoration to a firm regularly engaged in restoration of brick masonry that can demonstrate to Owner's satisfaction that, within previous ten years, firm has successfully performed and completed in a timely manner at least five projects similar in scope and type to work required on this Project Retain first subparagraph below if required or customary in Project area. Firms often specialize in and compete for either masonry repair or cleaning work, and they typically have different crews for each.

1. Field Supervision: Brick masonry restoration shall be directly supervised by a full-time foreman with experience equal to or greater than that required of Masonry Restoration Specialist. Foreman shall read and speak English fluently. Foreman shall be on site daily for duration of work of this Section. Same foreman shall remain on Project throughout work unless his performance is deemed unacceptable. Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that clay masonry restoration and cleaning work is in progress.
2. Restoration Worker Qualifications: Brick masonry restoration shall be carried out by a steady crew of skilled mechanics who are thoroughly experienced with restoration of brick masonry and materials and methods specified and have a minimum of three years' experience with work on buildings similar to that required by this Section. In acceptance or rejection of work of this Section, no allowance will be made for workers' incompetence or lack of skill.
   a. When masonry units are being patched, assign at least one worker among those performing patching work who is trained and certified by manufacturer of patching compound to apply its products.

B. Source Limitations: Obtain each type of material for masonry restoration (face brick, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.

C. Quality-Control Program: Prepare a written quality-control program for this Project to systematically demonstrate the ability of personnel to properly follow methods and use

materials and tools without damaging masonry. Include provisions for supervising performance and preventing damage due to worker fatigue.

D. Restoration Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of restoration work including protection of surrounding materials and Project site.

1. Include methods for keeping pointing mortar damp during curing period.
2. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.

E. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used, protection of surrounding materials, and control of runoff during operations.

1. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.

F. Cleaning and Repair Appearance Standard: Cleaned and repaired surfaces are to have a uniform appearance as viewed from 20 feet away by Architect. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.

G. Mockups: Prepare mockups of restoration and cleaning to demonstrate aesthetic effects and set quality standards for materials and execution and for fabrication and installation.

1. Masonry Repair: Prepare sample areas for each type of masonry material indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than 2 adjacent whole units or approximately 48 inches in least dimension. Demonstrate quality of materials, workmanship, and ability to blend with existing work. Include the following as a minimum:

   a. Replacement:
      1) Four brick units replaced.
   b. Patching: Three small holes at least 1 inch in diameter as directed for each type of masonry material indicated to be patched, so as to leave no evidence of repair.
2. Re-pointing: Rake out joints in 2 separate areas, each approximately 36 inches by 48 inches wide for each type of re-pointing required and re-point one of the areas.
3. Cleaning: Clean an area approximately 25 sq. ft. as indicated for each type of masonry and surface condition.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

H. Pre-installation Conference: Conduct conference at Project site.

1. Review methods and procedures related to masonry restoration and cleaning including, but not limited to, the following:
   a. Construction schedule. Verify availability of materials, Restoration Specialist's personnel, equipment, and facilities needed to make progress and avoid delays.
   b. Materials, material application, sequencing, tolerances, and required clearances.

1.7 REFERENCE STANDARDS

A. Work of this Section shall comply with applicable requirements and recommendations of latest editions of the documents listed herein, except as modified by more stringent requirements of the Contract Documents and of applicable laws, codes, and regulations of authorities having jurisdiction. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendations or suggestions shall be deemed to be mandatory under this Contract unless specifically indicated otherwise in Contract Documents. Provide a reference copy of each of the following standards at Project site during all periods when work of this Section is being performed. In each case in which there is a conflict between requirements of referenced standards; requirements of laws, codes, and regulations; and requirements of this Section, the most stringent or restrictive requirement shall govern.

1. ASTM International (ASTM)
   a. ASTM A 276, Standard Specification for Stainless Steel Bars and Shapes.
   b. ASTM A 580, Standard Specification for Stainless Steel Wire.
   c. ASTM A 666, Standard Specification for Annealed or Cold' Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
   d. ASTM A 780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
   e. ASTM A 951, Standard Specification for Masonry Joint Reinforcement.
   f. ASTM C 62, Standard Specification for Building Brick.
   g. ASTM C 67, Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
   h. ASTM C 216, Standard Specification for Facing Brick.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.

D. Store lime putty covered with water in sealed containers.

E. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.9 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry restoration and cleaning work to be performed according to manufacturers' written instructions and specified requirements.

B. Repair masonry units and re-point mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least 7 days after completion of the Work unless otherwise indicated. Do not use any material in brick masonry restoration work unless air and masonry temperatures arc within range recommended by material manufacturer or specified herein. In case of conflict, the most restrictive requirement shall govern.

C. Cold-Weather Requirements: Comply with the following procedures for masonry repair and mortar-joint pointing unless otherwise indicated:
   1. When air temperature is below 40 deg F heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F
   2. When mean daily air temperature is below 40 deg F provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 7 days after repair and pointing.
   3. Damage Caused by Freezing: Remove brick masonry restoration work determined by
   4. Architect to have been damaged by freezing conditions. Replace work to comply with requirements of this Section.

D. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

E. Use of Epoxy Patching Adhesive: Apply epoxy patching adhesive only when temperature of brick to be patched, temperature of air, and temperature of patching adhesive are between 50 deg F and 85 deg F or range recommended for use by adhesive manufacturer, whichever is more restrictive.

F. Contract Drawings
   1. The Drawings are two-dimensional representations of three-dimensional objects and do not show all surfaces. Perform work on all surfaces of projections, reveals, returns, and other elements and surfaces associated with areas on which work is indicated.

2. Where elements interface with existing work or work that is in place, field measure dimensions of existing and in-place elements before preparing shop drawings or beginning work.

G. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

H. Clean masonry surfaces only when air temperature is 40 deg F and above and is predicted to remain so for at least 7 days after completion of cleaning.

1.10 COORDINATION

A. Coordinate masonry restoration and cleaning with public circulation patterns at Project site. Some work is near public circulation patterns Public circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

B. Access for Observation and Approvals: Provide Architect access on a continuing basis to locations on which mock-ups are being carried out, on which work is ongoing, and where work has been completed to allow for observation and approvals. Provide pipe scaffolding and manpower to move, alter, and reconfigure scaffolding and planking; personnel lift and manpower to operate lift; or other means of access complying with all laws and regulations regarding safety and acceptable to Architect. Provide manpower and equipment to facilitate observation and approvals.

1. Extent of Access: Provide Architect hands-on access to each and every area of brick masonry that is restored as work of this Section. No approval of brick masonry restoration will be given before Architect is provided hands-on access to areas of brick masonry affected. Provide access for re-inspection of areas where work was not approved on first or subsequent inspections until Architect approves work.
2. Relocation of Means of Access: If Contractor moves scaffolding, lift, or other means of access before providing Architect with hands-on access to each and every surface of restored brick masonry and each and every surface of brick masonry that has been restored after previous work was rejected, Contractor shall reinstall means of access to provide for close-up inspection by Architect at no additional cost.

C. Knowledge of Site and Project Conditions: Before submitting bid, Bidders shall make themselves thoroughly familiar with the Drawings and Specifications, with the scope of this Project, and with all conditions at the Project site relating to requirements of this Section and limitations under which the work will be performed and shall determine or verify dimensions and quantities. Submission of a bid shall be considered conclusive evidence that Contractor is thoroughly familial' with Project requirements and site conditions and limitations.

D. Restoration of Damaged Masonry Units: Repair or replace all broken, lost, and damaged masonry units resulting from work of this Section to Architect’s satisfaction at no additional cost.

E. Protection of Building: Protect building elements and finishes from damage and from deterioration caused by work of this Section. Repair damage to materials and damage to finishes to Architect's satisfaction at no additional cost.

1. Exclusion of Water: Cover open joints and areas from which units have been removed during periods when work is suspended to ensure materials and finishes are not damaged by water penetration.
2. Prevention of Staining: Prevent grout, mortar, and patching materials from staining exposed faces of masonry.
3. Protection from Fire: Take all necessary precautions to prevent fire and spread of fire.

F. Restoration and Replacement of Damaged and Removed Interior Finishes: Repair, restore, or replace as required all interior finishes that are damaged or deteriorated due to exterior rehabilitation work. At the completion of the Work, all interior finishes shall be in a condition at least as good as or better than they were before work began. Comply with the requirements of Division 01 -"Execution and Closeout."

1.11 SEQUENCING AND SCHEDULING

A. Order replacement materials at earliest possible date to avoid delaying completion of the Work.

B. Order sand and portland cement for pointing mortar (based on testing) immediately after approval of mockups. Take delivery of and store at Project site a sufficient quantity to complete Project.

C. Perform masonry restoration work in the following sequence:

1. Remove plant growth.
2. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean masonry surfaces.
5. Where water repellents, specified in Division 07, are to be used on or near masonry work, delay application of these chemicals until after pointing.
6. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
7. Repair masonry, including replacing existing masonry with new masonry materials.
8. Rake out mortar from joints to be repointed.
9. Point mortar and sealant joints.
10. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.
11. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.

D. As scaffolding or other devices are removed, patch anchor holes used to attach scaffolding or other devices. Patch holes in masonry units to comply with "Masonry

Unit Patching" Article. Patch holes in mortar joints to comply with "Repointing Masonry" Article.

PART 2 - PRODUCTS

2.1 MASONRY MATERIALS

A. Salvage Face Brick and Common Brick: Salvaged face brick and common brick if removal is necessary. Salvaged brick will be used including cut, or sawed shapes where required to complete masonry restoration work. Sound existing brick salvaged during removal of brick masonry, cleaned of mortar, grout, and other contaminants, and thoroughly washed using clean water and fiber bristle brushes. Salvaged face brick as required.

1. Utilize salvaged brick for infill and repair.
2. Special Shapes:
   a. Mechanical chopping or breaking brick, or bonding pieces of brick together by adhesive, are not acceptable procedures for fabricating special shapes.

B. New Face Brick: If replacement face brick is required it shall comply with requirements of ASTM C 216, Grade SW, and shall match existing original face brick in hardness and weatherability, size, color, and surface texture and reflectance. Use new face brick matching existing original brick in work on all areas not on street facades.

1. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."

C. Common Brick: If replacement brick tor back-up construction is required it shall match existing brick in size and shall comply with requirements of ASTM C 62, Grade SW.

1. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."

2.2 MORTAR MATERIALS

A. Comply with requirements of Division 04 -"Restoration Mortars."

2.3 MANUFACTURED REPAIR MATERIALS

A. Masonry Patching Compound: Factory-mixed cementitious product that is custom manufactured for patching masonry.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Cathedral Stone Products, Inc.; Jahn M100 Terra Cotta and Brick Repair Mortar.
   b. Conproco Corporation; Mimic.
   c. Edison Coatings, Inc.; Custom System 45.

2. Use formulation that is vapor- and water permeable (equal to or more than the masonry unit), exhibits low shrinkage, has lower modulus of elasticity than the masonry units being repaired, and develops high bond strength to all types of masonry.
3. Use formulation having working qualities and retardation control to permit forming and sculpturing where necessary.
4. Formulate patching compound used for patching brick in colors and textures to match each masonry unit being patched. Provide not less than three colors to enable matching the color, texture, and variation of each unit.

2.4 TIES AND ANCHORS

A. Wire Anchors: 1I4-inch-diameter wire of AISI Type 302 stainless steel.

B. Brick Ties: 12 gage, 2-1/2-inch wide, crimped, Type 304 stainless steel buck anchors. Provide anchors of length to extend to a location 1-112 inches behind the outer face of the masonry unit in the outer wythe.

C. Brick Tie Anchors: I14-inch-diameter, 1-1/2 inch long nail drive anchor with Zamac body and Type 304 stainless steel drive screws. Provide "Zamac Hammer-Screw"® by Powers Fasteners, 2 Powers Lane, Brewster, NY 10509 (914-235-6300), or approved equal.

D. Miscellaneous Ties, Anchors, and Reinforcing: Of material indicated below and of size and configuration appropriate for use intended and approved by Architect.

1. Units That Are Not Welded: Type 302, Type 304, Type 304L, Type 316, or Type 316L stainless steel.
2. Units That Are Welded: Type 316L stainless steel.

2.5 REINFORCEMENT

A. General: Provide joint reinforcement as specified herein.

B. Joint Reinforcement: Complying with ASTM A 951 and as follows:

1. Material: AISI Type 304 stainless steel conforming to ASTM A 580.
2. Form: Welded truss design of9 gauge deformed stainless steel wire, consisting of two deformed longitudinal wires welded to a continuous diagonal cross wire at 16 inches o.c. Provide reinforcement with out-to-out spacing 1-112 to 2 inches less than the nominal thickness of the wall.
3. Corners: Provide special formed prefabricated pieces at comers.
4. Manufacturer: Subject to compliance with requirements, provide joint reinforcing by Dur-O-Wall, Hohmann & Barnard, Inc., or approved equal.

2.6 FLASHING

A. General: Refer to Sections flashings for Clay Tile, Copper Roofs, and Membrane Roofing requirements where intersecting masonry units.

B. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for priming substrates, bonding flashing sheets to each other and to substrates, terminating flashing at edges, and other uses as required to provide complete, watertight system.

2.7 MISCELLANEOUS MATERIALS

A. Injection Grout: Comply with requirements of Section 041 05 -"Restoration Mortars."

B. Sealant: Comply with requirements of Section 07900 -"Joint Sealants."

2.8 CLEANING MATERIALS

A. Water: Potable.

B. Hot Water: Water heated to a temperature of 140 to 160 deg F.

C. Job-Mixed Detergent Solution: Solution prepared by mixing 2 cups of tetrasodium polyphosphate, 1/2 cup of laundry detergent, and 20 quarts of hot water for every 5 gal. of solution required.

2.9 ACCESSORY MATERIALS

A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. ABR Products, Inc.; Rubber Mask.
   b. Price Research, Ltd.; Price Mask.
   c. PROSOCO; Sure Klean Strippable Masking.

B. Masking Tape: Nonstaining, nonabsorbent material, compatible with pointing mortar, joint primers, sealants, and surfaces adjacent to joints; that will easily come off entirely, including adhesive.

C. Antirust Coating: Fast-curing, lead- and chromate-free, self-curing, universal modified-alkyd primer complying with MPI #79, Alkyd Anticorrosive Metal Primer or SSPC-Paint 20 or SSPC-Paint 29 zinc-rich coating.

1. Use coating requiring no better than SSPC-SP 2, "Hand Tool Cleaning surface preparation according to manufacturer's literature or certified statement.
2. Use coating with a VOC content of 420 g/L (3.5 lb/gal.) or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.10 ANTI- GRAFFITI COATING -**NOT USED**

A. Coat all existing and newly installed brick as shown on drawings with anti-graffiti coating.

B. Product: Edison Coating Inc. Spray – Block 40 strippable/sacrificial coating for hard surfaces, or equal as judged by the Architect.

2.11 MISCELLANEOUS PRODUCTS

A. Select materials and methods of use based on the following, subject to approval of a mockup:

1. Previous effectiveness in performing the work involved.
2. Little possibility of damaging exposed surfaces.
3. Consistency of each application.
4. Uniformity of the resulting overall appearance.
5. Do not use products or tools that could do the following:
   a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
   b. Leave a residue on surfaces.

PART 3 - EXECUTION

3.1 GENERAL

A. Restoration Specialist Firms: Subject to compliance with requirements 1.9 “Quality Assurance”.

B. Protection: Before leaving fresh or unfinished work, fully cover and protect wall against rain and wind in an approved manner. Before continuing, brush clean previously laid work.

C. Welting Bricks and Existing Masonry: Thoroughly wet brick and existing masonry prior to installation to ensure that brick and masonry are nearly saturated but free of surface water (saturated, surface dry) when mortar is applied.

D. Full Shoved Joints: Ensure that all bed, head, and collar joints in masonry are shoved full so that mortar fully contacts all surfaces of masonry units in joints and there are no voids in brickwork. Do not slush joints.

3.2 PROTECTION

A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.

1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.

B. Prevent mortar from staining face of surrounding masonry and other surfaces.

1. Cover sills, ledges, and projections to protect from mortar droppings.
2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
3. Immediately remove mortar in contact with exposed masonry and other surfaces.
4. Clean mortar splatters from scaffolding at end of each day.

C. Remove gutters, downspouts and metal fascias adjacent to masonry and store where indicated during masonry restoration and cleaning. Reinstall when masonry restoration and cleaning are complete.

1. Provide temporary rain drainage during work to direct water away from building.

3.3 UNUSED ANCHOR REMOVAL

A. Remove masonry anchors, brackets, wood nailers, and other extraneous items no longer in use unless identified as historically significant or indicated to remain.

1. Remove items carefully to avoid spalling or cracking masonry.
2. Where directed, if an item cannot be removed without damaging surrounding masonry, do the following:

   a. Cut or grind off item approximately 3/4 inch beneath surface and core drill a recess of same depth in surrounding masonry as close around item as practical.
   b. Immediately paint exposed end of item with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended dry film thickness per coat. Keep paint off sides of recess.

3. Patch the hole where each item was removed unless directed to remove and replace the masonry unit.

3.4 BRICK REMOVAL AND REPLACEMENT

A. Remove bricks that are damaged, spalled, or deteriorated. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.

1. When removing single bricks, remove material from center of brick and work toward outside edges.

B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.

D. Remove in an undamaged condition as many whole bricks as possible.

1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
3. Store brick for reuse. Store off ground, on skids, and protected from weather.
4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.

E. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

F. Replace removed damaged brick with other removed brick and salvaged brick in good quality, where possible, or with new brick matching existing brick, including size. Do not use broken units unless they can be cut to usable size.

G. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.

1. Maintain joint width for replacement units to match existing joints.

H. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.

1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
2. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing masonry, and at same time as re-pointing of surrounding area.
3. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

3.5 PAINTING STEEL UNCOVERED DURING THE WORK

A. Inspect steel exposed during masonry removal. Where Architect determines that it is structural, or for other reasons cannot be totally removed, prepare and paint it as follows:

1. Remove paint, rust, and other contaminants according to SSPC-SP 2, "Hand Tool Cleaning, as applicable to meet paint manufacturer's recommended preparation.
2. Immediately paint exposed steel with two coats of antirust coating, following coating manufacturer's written instructions and without exceeding manufacturer's recommended rate of application (dry film thickness per coat).

B. If on inspection and rust removal, the cross section of a steel member is found to be reduced from rust by more than 1/16 inch, notify Architect before proceeding.

3.6 BRICK MASONRY UNIT RESTORATION

A. General: Lay salvaged face brick, new face brick, and common brick plumb, level, and true to line in full beds of mortar with bond pattern matching original bond pattern and courses and joints meeting those of original brickwork and adjacent remaining masonry as applicable. Provide supports, anchors, and reinforcing to ensure solid, stable construction and flashing and weep holes to ensure that water is directed to exterior of wall above openings and penetrations.

B. Patch the following masonry units unless another type of replacement or repair is indicated:

1. Units indicated to be patched.
2. Units with holes.
3. Units with chipped edges or corners.
4. Units with small areas of deep deterioration.

C. Remove and replace existing patches unless otherwise indicated or approved by Architect.

D. Cutting Masonry Units: Where brick are to be cut to size, make cuts neatly with a power-driven saw. Do not expose cut face to weather.

E. Jointing: Jointing of rebuilt masonry shall match that of existing masonry. Each course shall align with and be flush with existing work. Joints shall be uniform, matching widths of existing joints.

F. Joints: Fill all joints in brick masonry completely full with mortar as each course is laid.

1. Bed Joints: Form bed joints in one of the following ways:

   a. Apply a thick layer of smooth or slightly furrowed mortar on top of units previously laid and shove brick in place.
   b. Apply a full coat of mortar to boltom of brick and shove it into place.

2. Head and Collar Joints: Form head and collar joints by applying a full coat of mortal' to entire end or entire side as case requires and then shoving mortar covered end andlor side of brick tightly against bricks previously laid. Apply 3/8-inch-thick coat of mortar to back of facing brick before brick is installed.
3. Preparation for Pointing Joints in Brick Masonry: Rake joints in exposed brick masonry to prepare for pointing as specified in Division 04 -"Masonry Pointing. "

G. Supports, Anchors, and Fasteners: Build in supports, anchors, and fasteners as shown on approved shop drawings. Anchor fasteners solidly into sound masonry.

H. Joint Reinforcement: Provide continuous joint reinforcing in bed joints as indicated on Drawings but at a spacing not to exceed 16 inches o.c. vertically.

I. Flashing: Install flashing and as specified and as shown on approved shop drawings.
1. Install embedded flashing in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
2. Prime masonry substrates and substrates of other materials as recommended by flashing membrane manufacturer for optimum installation and adhesion of flashing membrane.
3. Allow masonry to cure as recommended by flashing membrane manufacturer before priming or applying adhesive or self-adhesive membrane.
4. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Unless otherwise indicated, place flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
5. Install metal flashing termination beneath flashing at exterior face of wall where sealant joints are indicated.

J. Disturbed Masonry Units: Remove masonry units disturbed after laying and relay in fresh mortar. If adjustments are required, remove masonry units and reset in fresh mortar; do not pound or tap masonry units to adjust.

K. Damaged Masonry Units: Remove and replace brick that are loose, chipped, broken, stained or damaged by freezing or for any other reason, or if units do not match adjoining units as intended. Furnish new units to match adjoining units and install in fresh mortar, pointed to eliminate evidence of replacement.

3.7 REPAIRING CRACKED BRICK MASONRY WHERE CRACKS EXTEND MORE THAN THREE COURSES

A. General: Remove cracked brick and mortar from joints around cracked brick and from all joints in which mortar is cracked and provide new brick matching existing brick set in new mortar.

B. Carefully remove brick to be replaced and mortar from joints around it and from joints in which mortar is cracked. Do not disturb adjacent brick. If bond of any brick is broken, remove brick and mortar around brick and reset brick.

C. Remove dirt and dust from hole using stiff bristle brush followed by clean compressed air.

D. Thoroughly wet brick to be inserted and surfaces at hole in masonry to receive brick to ensure that masol1l'Y is nearly saturated but surface dry at time of installation.

E. Ensure that all voids are filled with mortar by spreading mortal' on surfaces adjacent to hole and on surfaces of brick to be inserted so that excess mortal' is squeezed out of joints around brick as it is inserted.

F. Point joints to comply with requirements of Division 04 -"Masonry Pointing."

3.8 REPAIRING CRACKED BRICK MASONRY WHERE CRACKS EXTEND NO MORE THAN THREE COURSES

A. General: Rout out cracks in brick and fill with custom patching mortal' to match color and texture of adjacent surface.

B. Rout out cracks to a depth of 1/2 inch and a width of 1/4 inch. Do not damage brick surfaces.

C. Clean cracks thoroughly using fine brush followed by clean, oil-free compressed ail' to remove granular particles and dust.

D. Protect masonry at sides of crack from contact with sealant with masking tape or other approved method.

E. Provide backer rod to ensure sealant is of profile recommended by sealant manufacturer.

F. Install sealant to fully wet joint substrates and to completely fill top portion of joint.

G. Tool sealant flush with surface of adjacent masonry units.

H. Remove protection and clean away any sealant on masonry surfaces using solvent recommended by sealant manufacturer.

3.9 ROUTING AND FILLING CRACKS IN BRICK

A. General: Rout out cracks in brick and fill with custom patching mortal' to match color and texture of adjacent surface.

B. Rout out cracks to a depth of5/8 inch and a width of 1/8 inch. Do not damage brick surfaces.

C. Clean cracks thoroughly using fine brush followed by clean, oil-free compressed ail' to remove granular particles and dust.

D. Thoroughly rinse surfaces to ensure that substrate will not rapidly absorb water from patching mortar.

E. Brush crack with a mortar slurry coat and fill with specified composite mortal' matching color of adjacent cleaned brick.

F. Strike surface of repaired crack flush with face of brick. Finish surface off filled crack to match texture and finish of adjacent cleaned brick.

G. Protect installed mortar from too rapid drying to provide optimum conditions for mortar to cure.

3.10 POINTING

A. Point mortar joints in brick masonry to comply with the requirements of Division 04 - "Masonry Pointing."

3.11 PRELIMINARY CLEANING

A. Removing Plant Growth: Completely remove visible plant, moss, and shrub growth from masonry surfaces. Carefully remove plants, creepers, and vegetation by cutting at roots and allowing to dry as long as possible before removal. Remove loose soil and debris from open masonry joints to whatever depth they occur.

B. Preliminary Cleaning: Before beginning general cleaning, remove extraneous substances that are resistant to cleaning methods being used. Extraneous substances include paint, calking, asphalt, and tar.

1. Carefully remove heavy accumulations of material from surface of masonry with a sharp chisel. Do not scratch or chip masonry surface.
2. Remove paint and calking with alkaline paint remover.
   a. Comply with requirements in "Paint Removal" Article.
   b. Repeat application up to two times if needed.
3. Remove asphalt and tar with solvent-type paint remover.
   a. Comply with requirements in "Paint Removal" Article.
   b. Apply paint remover only to asphalt and tar by brush without prewetting.
   c. Allow paint remover to remain on surface for 10 to 30 minutes.
   d. Repeat application if needed.

3.12 CLEANING MASONRY, GENERAL

A. Proceed with cleaning in an orderly manner; work from top to bottom of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.

B. Use only those cleaning methods indicated for each masonry material and location.

1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
   a. Equip units with pressure gages.
3. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
4. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.
5. For steam application, use steam generator capable of delivering live steam at nozzle.

C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.

D. Water Application Methods:

1. Water-Soak Application: Soak masonry surfaces by applying water continuously and uniformly to limited area for time indicated. Apply water at low pressures and low volumes in multiple fine sprays using perforated hoses or multiple spray nozzles. Erect a protective enclosure constructed of polyethylene sheeting to cover area being sprayed.
2. Water-Spray Applications: Unless otherwise indicated, hold spray nozzle at least 6 inches from surface of masonry and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

E. Steam Cleaning: Apply steam to masonry surfaces at the very low pressures indicated for each type of masonry material. Hold nozzle at least 6 inches from surface of masonry and apply steam in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

F. After cleaning is complete, remove protection no longer required. Remove tape and adhesive marks.

3.13 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.

1. Do not use metal scrapers or brushes.
2. Do not use acidic or alkaline cleaners.

B. Wash adjacent woodwork and other non-masonry surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

D. Sweep and rake adjacent pavement and grounds to remove mortar and debris. Where necessary, pressure wash pavement surfaces to remove mortar, dust, dirt, and stains.

3.14 FIELD QUALITY CONTROL

A. Notify Owner's and Architect's Project representatives in advance of times when lift devices and scaffolding will be relocated. Do not relocate lift devices and scaffolding until Owner's and Architect's Project representatives have had reasonable opportunity to make observations of work areas at lift device or scaffold location.

3.15 WASTE MANAGEMENT

A. Coordinate with Division 01.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 04 01 20

SECTION 04 03 05.13 – RESTORATION MORTARS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work performed under this Section includes the performance criteria, labor, materials, equipment, and services necessary for the complete execution work of restoration mortars and grout as called for on the Drawings, as specified herein and as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Mortars for setting and pointing brick masonry.
2. Parging material

1.3 QUALITY ASSURANCE

A. Restoration Specialist Qualifications: Award brick masonry restoration to a firm regularly engaged in restoration of brick masonry that can demonstrate to Owner's satisfaction that, within previous ten years, firm has successfully performed and completed in a timely manner at least five projects similar in scope and type to work required on this Project.

1. Field Supervision: Brick masonry restoration shall be directly supervised by a full-time foreman with experience equal to or greater than that required of Masonry Restoration Specialist. Foreman shall be on site daily for duration of work of this Section. Same foreman shall remain on Project throughout work unless his performance is deemed unacceptable. Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that clay masonry restoration and cleaning work is in progress.
2. Brick masonry restoration shall be carried out by a steady crew of skilled mechanics who are thoroughly experienced with restoration of materials and methods specified and have a minimum of three years' experience with work on buildings similar to that required by this Section. In acceptance or rejection of work of this Section, no allowance will be made for workers' incompetence or lack of skill.

a. When masonry units are being patched, assign at least one worker among those performing patching work who is trained and certified by manufacturer of patching compound to apply its products.

B. Referenced Standards: Work of this Section shall comply with applicable requirements and recommendations of latest editions of the documents listed herein, except as modified by more stringent requirements of the Contract Documents and of applicable laws, codes, and regulations of authorities having jurisdiction. Where the language in any of the documents referred to herein is in the form of a recommendation or suggestion, such recommendations or suggestions shall be deemed to be mandatory under this Contract unless specifically indicated otherwise in Contract Documents. Provide a reference copy of each of the following standards at Project site during all periods when work of this Section is being performed. In each case in which there is a conflict between requirements of referenced standards; requirements of laws, codes, and regulations; and requirements of this Section, the most stringent or restrictive requirement shall govern.

1. ASTM International (ASTM)
   a. ASTM C 144, Standard Specification for Aggregate for Masonry Mortar.
   b. ASTM C 150, Standard Specification for Portland Cement.
   c. ASTM C 207, Standard Specification for Hydrated Lime for Masonry Purposes.
   d. ASTM C 270, Standard Specification for Mortar' for Unit Masonry.

C. Source of Materials: Obtain each type of material required for restoration mortars from a single source to ensure a match in quality, performance, and appearance,

D. Knowledge of Site and Project Conditions: Before submitting bid, Bidders shall make themselves thoroughly familiar with the Drawings and Specifications, with the scope of this Project, and with all conditions at the Project site relating to requirements of this Section and limitations under which the work will be performed and shall determine or verify dimensions and quantities. Submission of a bid shall be considered conclusive evidence that Contractor is thoroughly familiar with Project requirements and site conditions and limitations.

E. Laboratory for Mortar Analysis: Laboratory regularly engaged in analysis of mortar used in historic buildings and accepted in writing by Architect.

1.4 ACTION SUBMITTALS

A. Product Data: Manufacturer's published technical data for each product to be used in work of this Section including material description, chemical composition (ingredients and proportions), physical properties, recommendations for application and use, test reports and certificates verifying that product complies with specified requirements, and Material Safety Data Sheets (MSDS).

B. Samples:

1. Existing Mortar: Samples of existing mortars from stone masonry, brick masonry, specific masonry to each project, to total one cubic inch taken from a minimum of three areas or as recommended by testing agency.
2. Aggregate from Existing Mortar: Samples of aggregate from analysis of existing mortars from masonry, each to total two cubic inches from a minimum of three areas or as recommended by testing agency. Provide sieve analysis (ASTM C 144) with samples.
3. Pointing Mortar: Cured mortar samples set in 1/2-inch by 6-inch plastic or aluminum channels for approval of color and texture. Samples shall match existing mortar. Provide the following:
   a. Mortar for each type of masonry.
4. Grouts: Cured samples of grouts for anchoring pins and patching cracked masonry units matching each masonry substrate requiring grout, minimum 3 inch diameter x 1/2 inch thick.
   a. Grout for each masonry type.
5. Sand for Pointing Mortars: Two-pound sample of each type of sand proposed for use in pointing mortars. Include sieve analysis (ASTM C 144).
6. Custom Patching Mortar for Patching Stone: 4-inch x 4-inch x I -inch cured samples of each type and color of mortar required for approval of color and texture. Samples shall match clean existing cast stone.
7. Custom Patching Mortar for Patching Brick: 4-inch x 4-inch x I -inch cured samples for approval of color and texture. Samples shall match clean existing brick.
8. Custom Mortar for Installing Stone Dutchmen: 4-inch x 4-inch x I -inch cured samples for approval of color and texture. Samples shall match clean existing cast stone.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Qualification data for firm and personnel specified in “Quality Assurance” Article that demonstrates that both firm and personnel have capabilities and experience complying with requirements specified. For firm and foreman, provide a list of at least three completed projects similar in size and scope to the work required on this Project. For each project list project name, address, architect, conservator, supervising preservation agency, scope of contractor's work, and other relevant information.

   1. Submit certification from composite patching mortar manufacturers that technicians proposed to perform the work have been trained and are certified in the application of the patching mortar.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products and materials to prevent damage, deterioration, or degradation and intrusion of foreign material.

B. Discard and remove from site deteriorated materials, contaminated materials, and products that have exceeded their expiration dates. Replace with fresh materials.

1.7 PROJECT CONDITIONS

A. General: Perform work only when temperature of products being used and all temperature and humidity comply with manufacturer's requirements and requirements of this Section. In case of conflict, the most stringent requirements shall govern.

B. Prohibited Materials: Masonry cements, masonry mortars, and ingredients not specifically specified in this Section and approved by Architect are strictly prohibited.

C. Proprietary Materials: Do not use proprietary patching mortars and adhesives unless temperatures are between 50 deg F and 80 deg F and will remain within that range for at least 48 hours after work has been completed unless work at other temperatures is specifically approved by manufacturer of patching mortar and by Architect.

D. Mortars: Do not mix or use mortars when either or both air temperature or masonry temperature is below 40 deg F or when either temperature is expected to drop below 40 deg F within 48 hours of mortar application unless Architect has approved both Contractor's work proposal for cold-weather masonry work and also specific masonry work to be done in each instance.

1. Masonry work in temperatures below 40 deg F shall comply with requirements of this Section, with requirements of sections in which mortar is used to set and point masonry, and with work proposal specifically approved by Architect.

2. Remove masonry work determined by Architect to have been damaged by freezing conditions and replace following requirements of this Section.

PART 2 - PRODUCTS

2.1 MORTAR AND GROUT PRODUCTS

A. White Portland Cement: ASTM C 150, Type I.

B. Portland Cement: ASTM C 150, Type I or Type II, non-staining. Do not use masonry cement.

C. Hydrated Lime: ASTM C 207, Type S.

D. Sand: Clean sharp sand, free of loam, silt, soluble salts, organic matter, and other deleterious substances and graded in compliance with ASTM C 144. Where mortar is to match existing original mortar, sand or other aggregate shall be selected to provide mortar matching color and texture of original mortar insofar as possible to ensure that a minimum amount of pigment is required to provide a color match. Sieve and mix sand and aggregates to provide mortar matching original mortar.

E. Water: Clean and free of substances deleterious to mortar, masonry, and embedded elements.

F. Pigments: Stable, non-fading, alkali-resistant, inorganic oxide pigments with a history of satisfactory performance in mortars containing lime.

G. Grout and Slurry for Restoration of Cracked, Broken, or Previously Grouted Masonry: Two-component, latex-modified cementitious compound, specifically manufactured for masonry restoration. Provide Custom System 45, available from Edison Chemical Systems, Inc., 25 Grant Street, Waterbury, CT 06704 (203-597-9727). Provide colors to match color of clean existing material being reinforced.

H. Composite Patching Mortar for Stone: Two-component, latex-modified cementitious compounds, specifically manufactured for masonry restoration. Provide Custom System 45, available from Edison Chemical Systems, Inc., 25 Grant Street, Waterbury, CT 06704 (203-597-9727). Provide color to match color of clean cast stone being patched.

I. Composite Patching Mortar for Brick: Two-component, latex-modified cementitious compounds, specifically manufactured for masonry restoration. Provide Custom System 45, available from Edison Chemical Systems, Inc., 25 Grant Street, Waterbury, CT 06704 (203-597-9727). Provide custom color to match color of cleaned brick being patched.

J. Parging for Masonry or Concrete: Two-component, latex-modified cementitious compounds, specifically manufactured for masonry restoration. Provide Custom System 45, available from Edison Chemical Systems, Inc., 25 Grant Street, Waterbury, CT 06704 (203-597-9727). Other acceptable means are a Type N mortar application or a preblended parging mix such as “Sakrete Parging Mix” or equal to provide a smooth finish.

K. Admixture for Mortar for Setting Stone Dutchmen: Laticrete 4237 Grout and Mortar Admixture for "thin set" mortar as manufactured by Laticrete International Inc., or approved equal.

L. Prohibited Materials: No additives or admixtures other than those specified shall be used. No chlorides or aggressive corrosive chemicals shall be used.

2.2 MORTAR MIXES

1. Type "O" Mortar for Pointing Outer 3/4-Inch Depth of Joints in Brick and Stone Masonry ***if*** confirmed by mortar testing agency of historic mortars for the project.
   a. 1 part by volume white Portland cement, gray Portland cement, or a combination of white and gray Portland cement (Type I) as required to produce color of original mortar in masonry being pointed with no addition of pigment or with minimum addition of pigment.
   b. 2 parts by volume hydrated lime (Type S)

c. 7 parts by volume sand (selected to match sand in original mortar of masonry being pointed)
d. Oxide pigments as required to adjust color of mortar mix to as close a match to original mortar as possible using appropriate colored cements and aggregates to match original color of mortar in masonry being pointed but not to exceed 7 percent of the weight of the cement.
e. Do not use modern additives unless permitted in writing by Architect.

B. Mortars for Setting Dutchmen: Mortars specified hereinafter shall comply with ASTM C 270, "Standard Specification for Mortar for Unit Masonry." Mortar mixes may change and may require adjustment before and during construction in accordance with pre-construction conformance testing, field testing, and Architect's evaluation of testing and test results.
1. Slurry for Pre-treating Masonry to be Repaired: Grout and Slurry for Restoration of Cracked, Broken, or Previously Grouted Masonry as specified above.
2. "Thin Set" Mortar for Setting Stone Dutchmen: Use when mortar bed is less than 3/8-inch-thick to produce an initially tacky mortar exhibiting high strength properties when set.
a. 1 part by volume white Portland cement (Type I)
b. 3 parts by volume tine "00" sand (selected to match color of existing clean stone)
c. Temper to workable consistency with Laticrete 4237 polymer admixture mixed in accordance with manufacturer's recommendations for high strength I "thin set" mortar.

2.3 MIXING OF MORTAR

A. Measure mortar ingredients carefully using containers with fixed volumes so that proportions are controlled and maintained throughout all work periods.

B. Mix mortar in an approved type of power-operated batch mixer. Mix for time required to produce a homogeneous plastic mortal' but not less than five minutes: approximately two minutes for mixing dry materials and not less than three minutes for mixing after water has been added.

C. Use minimum amount of water to produce a workable consistency for mortar's intended purpose.
1. Mortar for Pointing: As dry a consistency as will produce a mortal' sufficiently plastic to be worked into joints.
2. Mortar for Slurry: Consistency as will be brushable.

D. Where mortar or grout is required in small batches of less than one cubic yard and Architect specifically approves, mortar may be mixed by hand in clean wooden or metal boxes prepared for that purpose provided that Architect approves mixing boxes and methods of mixing and transferring mortar.

E. After mixing, mortars for pointing or setting shall sit for 20 minutes prior to use to allow for initial shrinkage. Mortar shall be placed in final position within two hours of mixing. Re-tempering of partially hardened material is not permitted.

F. Mortar for grout shall be placed in final position within two hours of mixing. Re-tempering of partially hardened material is not permitted.

G. Custom Patching Mortars, Grouts, and Adhesives: Mix in strict accordance with manufacturer's written instructions.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install mortars, grouts, and patching mixtures as part of the work of the following

1. Divisions 04: Masonry Pointing, Maintenance of Stone Masonry, Cast Stone, Maintenance of Brick Masonry, Architectural Terra Cotta.

3.2 WASTE MANAGEMENT

A. Coordinate with Division 01.
1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 04 03 05.13

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SECTION 04 03 05.16 – RESTORATION MASONRY REPOINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work performed under this Section includes the performance criteria, labor, materials, equipment, and services necessary for the complete work of masonry re-pointing as shown on the Drawings, as specified herein and as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Preparing and pointing joints in masonry.
2. Types of approved mortar removal tools
3. Required approvals for use of power tools on retooling.
4. Preparing and pointing rear portions of joints (deep pointing) in masonry.

B. Related Work Specified Elsewhere

1. Division 04: Restoration Mortars
2. Division 09: Joint sealants.

1.3 QUALITY ASSURANCE

A. Restoration Specialist Qualifications: Award brick masonry restoration to a firm regularly engaged in restoration of brick masonry that can demonstrate to Owner's satisfaction that, within previous ten years, firm has successfully performed and completed in a timely manner at least five projects similar in scope and type to work required on this Project.

1. Field Supervision: Brick masonry restoration shall be directly supervised by a full-time foreman with experience equal to or greater than that required of Masonry Restoration Specialist. Foreman shall be on site daily for duration of work of this Section. Same foreman shall remain on Project throughout work unless his performance is deemed unacceptable. Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that clay masonry restoration and cleaning work is in progress.
2. Brick masonry restoration shall be carried out by a steady crew of skilled mechanics who are thoroughly experienced with restoration of materials and methods specified and have a minimum of three years' experience with work on buildings similar to that required by this Section. In acceptance or rejection of

work of this Section, no allowance will be made for workers' incompetence or lack of skill.

a. When masonry units are being patched, assign at least one worker among those performing patching work who is trained and certified by manufacturer of patching compound to apply its products.

1.4 ACTION SUBMITTALS

A. Samples
   1. Mortar and grout.

B. Prepare mock-ups as specified in Article "Mock-Ups," below.

C. Work Description: Provide detailed description of proposed procedures for joint preparation and pointing of each masonry material and condition (including installation of lead joint covers). Work description for each condition shall include:
   1. Materials and methods: Proposed materials, methods, tools, and equipment to be used.
   2. Protection: Description, including drawings, outlining methods and procedures for protection of personnel, public, and existing construction during work of this Section.
   3. Alternate Methods and Materials (If Any): Description of proposed alternate methods and materials (if any) to those specified for any phase of masonry pointing work. Provide evidence of successful use on comparable projects and demonstrate effectiveness for use on this Project.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Qualification data for firm and personnel specified in “Quality Assurance” Article that demonstrates that both firm and personnel have capabilities and experience complying with requirements specified. For firm and foreman, provide a list of at least three completed historic projects similar in size and scope to the work required on this Project. For each project list project name, address, architect and or conservator, supervising preservation agency, scope of contractor's work, and other relevant information.

1.6 MOCK-UPS

A. General: Before beginning general masonry pointing, prepare mock-ups to provide standards for work of this Section. Do not proceed with masonry pointing until Architect has approved mock-ups.
   1. Locate mock-ups as directed by Architect
   2. Notify Architect 48 hours prior to start of each mock-up.
   3. Architect will monitor mock-ups. Mock-ups not performed in presence of Architect will be rejected.
   4. Use crew that will execute the work and follow requirements of this Section.

5. Allow mock-ups using mortar to dry for seven days to allow mortar to reach final color and allow potential problems to appear. Notify Architect when mock-ups are ready for review.
6. Repeat mock-ups as necessary to obtain Architect's approval.
7. Protect approved mock-ups to ensure that they are without damage, deterioration, or alteration at time of Substantial Completion.
8. Approved mock-ups in undamaged condition at time of Substantial Completion may be incorporated into the Work.
9. Approved mock-ups will represent minimum standards for masonry pointing. Subsequent masonry pointing work that does not meet standards of approved mock-ups will be rejected and will require repointing.

B. Prepare the Following Mock-Ups
   1. Joint Preparation in each type of Masonry: One panel including at least 25 square feet plus 12 linear feet of joint.
   2. Pointing of Joints in each type of Masonry: One panel including at least 25 square feet plus 12 linear feet of joint.

C. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

D. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products and materials to prevent damage, deterioration, or degradation and intrusion of foreign material.

B. Discard and remove from site deteriorated materials, contaminated materials, and products that have exceeded their expiration dates. Replace with fresh materials.

1.8 PROJECT CONDITIONS

A. General: Perform work only when temperature of products being used and air temperature and humidity comply with manufacturer's requirements and requirements of this Section. In case of conflict, the most stringent requirements shall govern.

B. Safety: Use all means necessary to protect all persons, whether or not involved in the work of this Section, from harm caused by or resulting from work of this Section.

C. Protection of Building and Property
   1. Provide all protection and procedures necessary to protect masonry not being pointed and all other elements and materials from damage and from deterioration during work of this Section.

2. Repair damage to elements and materials caused by masonry pointing work, using mechanics experienced in the respective type of work, to Architect's satisfaction at no additional cost.
3. Protect components of storm drainage systems against damage and blockage caused or accelerated by work of this Section.

D. Protection from Fire: Take all necessary precautions to prevent fire and to prevent spread of fire.

E. Dust: Minimize dissemination of dust to greatest extent possible.
1. Contractor shall hold Owner, Architect, and their consultants harmless from all claims relating to dust resulting from work of this Section.

F. Protection of Masonry Being Pointed: Use all necessary care to protect existing masonry from damage during work of this Section. Take special care in removing existing mortar to ensure that no arrises are damaged, chipped, or broken. Contractor shall replace or repair masonry units damaged by work of this Section as directed by and to complete satisfaction of the Architect at no additional cost to the Owner.

G. Staining: Prevent grout or mortar from staining face of masonry to be left exposed. Protect sills, ledges, and projections from mortar droppings. Immediately remove grout or mortar in contact with such masonry.

H. Protection from Rain: Protect pointed joints with heavy waterproof sheeting from direct attack by rain or other precipitation for at least 24 hours after mortar has been applied.

I. Contract Drawings: Drawings are two-dimensional representations of three-dimensional objects and do not show all surfaces. Perform work on all surfaces of projections, reveals, ornament, and other elements associated with areas on which work is indicated.

J. Prohibited Materials: Masonry cements, masonry mortars, and ingredients not specifically specified in this Section and approved by Architect are strictly prohibited.

K. Cold-Weather Requirements: Comply with the following procedures for masonry repair and mortar-joint pointing unless otherwise indicated:
1. When air temperature is below 40 deg F heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between 40 and 120 deg F
2. When mean daily air temperature is below 40 deg F provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 7 days after repair and pointing.
3. Damage Caused by Freezing: Remove brick masonry restoration work determined by
4. Architect to have been damaged by freezing conditions. Replace work to comply with requirements of this Section.

L. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from

mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of 90 deg F and above unless otherwise indicated.

PART 2 - PRODUCTS

2.1 TOOLS

A. Hand Tools for Joint Preparation: Chisels, hammers, and mallets.
   1. Thickness of Chisels: Chisels used in masonry joints shall have a maximum thickness of 5/8 times joint width extending back from tip of chisel at least two times depth at which chisel will be inserted into joint.
   2. Special Tools: Provide special knives or special thin cutter blades for use in joints less than 1/8-inch wide.

B. Power Tools for Joint Preparation: Standard tools and equipment, modified tools and equipment, and custom designed and fabricated tools and equipment as required to remove mortar from narrow joints without damaging masonry and masonry units. Use power tools only under conditions described in Part 3, below and only if specifically approved by Architect in writing. Failure to demonstrate that use of selected power tools removes mortar without damaging masonry units will result in prohibition of use of power tools and requirement that mortar be removed using hand tools only. If, after approval of power tool use for mortar removal, masonry, or masonry units are damaged through use of power tools, the further use of power tools will be prohibited and mortar shall be removed using hand tools only.
   1. Electric Grinders: Small, hand-held electric grinders with thin diamond or abrasive blades no greater than 1/16-inch-thick and a maximum of 4-1/2-inch diameter.
   2. Pneumatic Grinders: Specially modified pneumatic die grinders with thin abrasive blades (0.060 inch thick).
   3. Custom Pneumatic Head and Chisels Designed for Mortar Removal: Pneumatic head and thin carbide-tipped chisels specifically designed for removal of mortar from joints in historic masonry with air compressor, hoses, valves, and other equipment required to provide complete mortar removal system. Pneumatic head shall not have a retainer to hold chisels in place. Provide pneumatic head and chisels by Trow and Holden, Barre, VT (800-451-4349), or approved equal.

C. Brushes: Stiff, natural bristle brushes.

D. Pointing Trowels: Long, thin pointing trowels narrower than joints being pointed.
   1. Fabricate special trowels for masonry pointing if necessary to ensure proper insertion and optimum compaction of mortar.

2.2 MORTAR

A. Comply with requirements of Division 04 -"Restoration Mortars." Mortar for each type of masonry shall match existing original mortar (in clean condition) in color, texture, and other visual qualities.

2.3 Miscellaneous materials

A. Joint Sealants: Comply with requirements of Division 07 -"Joint Sealants."

PART 3 - EXECUTION

3.1 GENERAL PREPARATION

A. Examine areas and conditions under which work of this Section will be performed. Correct conditions detrimental to timely and proper completion of work. Do not proceed until unsatisfactory conditions have been corrected.

B. Erect dust impervious barriers and take other measures necessary to prevent dust from traveling beyond work platform before using power grinders, pneumatic chisels, or hand methods that generate airborne dust.

3.2 JOINT PREPARATION

A. General: Remove mortar from joints to a depth of 3/4 inch or to sound mortar, whichever is greater. In all cases remove all deteriorated, weathered, and loose material.
   1. Completely remove mortar from surfaces of masonry units adjacent to joint to ensure that new mortar bonds directly with masonry units.
   2. Cut surface of mortar at rear of joint at a uniform depth from and parallel to wall surface.
   3. Do not damage faces or arrises of masonry units during joint preparation. Cease joint preparation work if, in Architect's judgment, masonry units are damaged. Do not resume work until tools, workers, and methodology have been corrected to ensure that masonry units are not damaged and that work meets standard set by approved mock-up.

B. Mortar Removal Using Hand Tools: Use hand tools for removal of mortar from head joints in masonry work, all joints less than 6 inches long, and from other joints in which use of power tools might damage masonry units. Use hand tools to complete mortar removal from joints where power tools have been used to partially remove mortar.
   1. Joints 1/8-Inch or Less in Width: Rake mortar from joints manually with a sharp knife blade or cutter made for this purpose. Cutter may be used with or without aid of a hammer.

2. Sharpening Tools: Sharpen chisels as required to maintain sharp edges that cut mortar and prevent damage to masonry units, but not less frequently than hourly.

C. Mortar Removal Using Power Tools
1. Demonstrated Ability of Mechanics: Prior to beginning work, demonstrate that workers using power tools are proficient in use of power tools for joint preparation. Failure to demonstrate to Architect's satisfaction that each worker is proficient, and that power tool joint preparation does not result in damage to masonry units shall result in prohibition of use of power tools for joint preparation. If proficiency is not demonstrated, or if work in progress results in damage to masonry to remain, *all power tool work shall cease, and joints shall be prepared for pointing using only hand-powered tools*.
2. Rotary Power Tools: With Architect's specific, prior written approval following successful demonstrations of skill by mechanics, power grinders and / or pneumatic grinders may be used to partially remove mortar from horizontal (bed) joints in masonry and from joints longer than 6 inches in masonry where there is no danger of cutting into adjacent masonry units.
   a. Limitations on Use of Electric Power Grinders: Do not use electric power grinders on joints less than 3/16-inch wide or less than 6 inches long or where ornament, elaborate profile, or other surface irregularity might make damage to masonry units likely.
   b. Limitations on Use of Modified Pneumatic Die Grinders: Do not use modified pneumatic die grinders with custom thin blades on joints less than1-1/2 times the width of the grinder blade.
   c. Extent of Mortar Removal Using Power Grinders: Use power grinder only to score one kerf cut in center of each joint to depth of mortar removal required. Remove remaining mortar using hand tools or, if approved, pneumatically powered chisels.
      1) Stop kerf at least 4 inches from inside corners and projecting elements. Remove remaining mortar using hand tools or pneumatically powered chisels.
   d. Jigs: Construct jigs to guide and limit power tools as required to prevent damage to masonry units.
3. Pneumatic Heads with Chisels: With Architect's specific, prior written approval following successful demonstrations of skill by mechanics, pneumatically powered chisels may be used to remove mortar from joints in lieu of hand tools. If work using pneumatically powered chisels results in damage to masonry to remain, work using pneumatic chisels shall cease, and joints shall be prepared using only hand tools.

D. Cleaning: Remove loose mortar and foreign material from raked joints using a fine, stiff natural bristle brush. Remove remaining particles, dust, and dirt using filtered, oil- free compressed air. Ensure that dust and dirt are not blown back into previously cleaned joints.

E. Restoration of Damaged Masonry Units: Repair or replace masonry units damaged during joint preparation to Architect's satisfaction at no additional cost.

3.3 MORTAR APPLICATION

A. Wetting: Thoroughly wet masonry 24 hours prior to and again immediately before masonry pointing. Let surfaces dry slightly. At time of masonry pointing, surfaces shall be damp, so that they do not rapidly absorb moisture, but free of standing water (saturated, surface dry).
   1. Failure to Properly Wet Substrate: Evidence that masonry to be pointed has not been properly dampened to prevent water in the mortar from being too rapidly absorbed by the masonry will be cause for Restoration Consultant to reject pointing work. Remove and replace rejected pointing, including proper joint preparation, to meet requirements of this Section at no additional cost.

B. Masonry Pointing: Point joints as follows.
   1. Using a long, thin masonry pointing trowel, tightly pack mortar into joints in layers not exceeding 1/4-inch thick to fill joint to match original sound joints.
   2. Begin by filling areas from which mortar is missing to a depth greater than 3/4 inch in 1/4-inch-thick layers to within 3/4 inch of masonry surface to provide a uniform substrate for final masonry pointing. Fill final 3/4-inch depth continuously and uniformly in 1/4-inch-thick layers.
   3. Firmly iron each layer to compact mortar and ensure full bond between mortar and masonry units and a firm, solid joint.
   4. Allow each layer to reach thumbprint hardness before applying succeeding layer. Do not let previous layer dry out before applying succeeding layer. Construct uniform joints.
   5. Do not spread mortar over edges onto exposed surfaces of masonry units. Do not featheredge mortar.
   6. When stopping work at end of each day or for other reasons, stagger layers of mortar so that there will be no through joints in masonry pointing. Stagger joints in layers so that they are at least 3 inches from each other.
   7. Where applying new work to that of a prior day, dampen previous work as well as existing masonry to ensure good bond.

3.4 JOINT TOOLING

A. Tooling: After final layer of mortar is "leather hard," tool joints with a flat rule jointer, or as directed by Architect.

B. Profile: Tool joints to profile to match original joint profiles. Solidly compress mortar so that it adheres well to masonry on both sides of joints and forms a dense surface. Premature or late tooling will result in unacceptable finishes, which will be rejected.

3.5 CURING

A. Keep newly pointed joints damp for at least 48 hours after mortar has been inserted. Do not apply a direct stream of water to joints for at least 24 hours after mortar has been placed.

B. Ensure masonry temperature remains as required by specifications until mortar is thoroughly cured.

3.6 CLEANING AND REPAIR OF MORTAR JOINTS

A. Water Washing: Wash pointed masonry with clean filtered water and nonabrasive hand tools to remove mortar debris from masonry surfaces. Do not use chemical cleaners.
   1. Wash within 48 hours following completion of masonry pointing.
   2. Use blunt-edged wood scrapers, stiff natural bristle brushes, and rough towels along with water to remove mortar debris. Do not use wire brushes.

B. Repair of Pointed Joints: As cleaning progresses, examine joints to locate cracks, holes, and other defects. Carefully point up and fill such defects with mortar. Where joints are defective in opinion of Architect, cut out joints and refill with pointing mortar exercising extreme care to ensure that color matches that of adjacent masonry pointing work. Exposed joint surfaces shall be free from protruding mortar, holes, pits, depressions, and other defects.

3.7 DEEP POINT JOINTS IN MASONRY

A. General: Remove mortar to depth of masonry using wedges, shims, and/or other approved methods to prevent displacement of masonry during removal. Clean joints. Install mortar to fill deep portion of joints (portion of joint behind 3/4 inches from the plane of the wall). Point outer 3/4-inch depth of joint as specified above.

3.8 CORRECTIVE MEASURES

A. Defective Joints: Should a crack occur in any joint surface, should mortar fail to adhere to or pull away from masonry unit, or should there be other defects in pointed joints, remove mortar and repaint following requirements of this Section to Architect's satisfaction.

B. Should Architect determine that any masonry pointing work does not equal or exceed minimum standard established by approved mock-up, cut out mortar to a depth of 34 inch and repoint following requirements of this Section to Architect's satisfaction at no additional cost to Owner.

3.9 WASTE MANAGEMENT

A. Coordinate with Division 01.
   1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
   2. Set aside and protect materials suitable for reuse and/or remanufacturing.

3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 04 03 05.16

SECTION 04 21 29 – TERRA COTTA MASONRY

PART 1 - GENERAL

SCHEDULE 0 - SUMMARY

A. The work of this section includes, but shall not be limited to, [stick built] terra cotta panel rain screen system, a component of the exterior cladding system, consisting of the following:
   1. Aluminum vertical or horizontal track and clip (secondary support) system.
   2. Extruded hollow terra cotta panels.
   3. Silicone gaskets and isolators.
   4. Anchors, fasteners, flashings, weatherseals, cover plates and formed metal trim through and at the perimeter of the terra cotta panel rain screen system and other accessories required for a complete installation.

B. Related Requirements:
   1. Section 03 30 00 "Cast in Place Concrete"
   2. Section 03 40 00 “Precast Concrete”
   3. Section 04 22 00 "Concrete Unit Masonry"
   4. Section 05 10 00 "Structural Steel"
   5. Section 05 40 00 "Cold Formed Metal Framing"
   6. Section 06 16 00 “Sheathing”
   7. Section 06 10 00 "Rough Carpentry"

1.2 DEFINITIONS

A. Hollow core terra cotta panels hung on a pre-engineered aluminum track system with aluminum slip supports, gaskets and trim.
   1. The system shall consist of terra cotta panels supported by extruded aluminum clips attached to aluminum vertical or horizontal track.
   2. Silicone gaskets inserted into vertical track and silicone isolators wrapped around clips; provide [standard black] at vertical joint compression bubbles in every track to maintain panel position across the façade and prevent wind induced rattle.
   3. Track to be attached to specified portion of wall assembly structurally sufficient to carry the terra cotta panel rain screen system and associated loads. TerraClad™ standard system weighs approximately 16-17 lbs/sq.ft.

B. System shall be designed as a “drained and back ventilated rain screen system” to allow for the following:
   1. Pressure equalization in the air space behind the terra cotta panel and allow for subsequent drying within the cavity via ventilation.
   2. Movements within the structure, as specified in 1.3.
   3. Performance Requirements of this Section, and to fit within the space allotted without projections into adjacent finished space.

C. Flatness: System shall be flat with no noticeable warp, buckling, deflections or other surface irregularities within manufacturer's specified tolerances.

D. Design Criteria: Terra cotta panel rain screen system to be based on the architect's drawings and specifications (construction documents), which indicate sizes, profiles, finishes, and dimensional requirements.

1.3 ACTION SUBMITTALS

A. Shop Drawings shall be submitted for approval prior to fabrication including:
   1. Elevations for each condition indicating terra cotta panel type and location.
   2. Section details, to convey proper fabrication / installation for terra cotta panel types.
   3. Shop drawings for wall assembly to receive terra cotta panel rain screen system to be coordinated with terra cotta panel rain screen system shop drawings.

B. Samples: 3 sets of the following samples in the selected finish and color.
   1. Initial color, if custom, will be submitted on a 6"h x 6"w tile. Standard colors may be selected from manufacturer's color box.
   2. Two 12-inche long by full size profile of each type of panel. Samples shall represent the full range of color and texture proposed for the Work.
   3. [One 12-inch long by full profile sample of each type sheet metal trim and closure piece.

1.4 QUALITY ASSURANCE

A. Installer / Fabricator Qualifications: Engage an experienced Installer / Fabricator, who has specialized in the erection and installation of types of systems similar to the required for this Project, to erect the terra cotta panel rain screen system.
   1. Installer / Fabricator shall be trained by the manufacturer and has engaged in similar work for a period of no less than 5 years.

B. Manufacturer's qualifications: Engage a Manufacturer experienced in the manufacturer of terra cotta panel rain screen system similar to those indicated for the Project, and with a record of successful
   1. The terra cotta panel rain screen system, including panels, vertical track or horizontal track, clips and gaskets / isolators, shall be provided by the same firm unless otherwise noted.
   2. The terra cotta panel rain screen system shall have been in use for at least 5 years.

C. [Mockup: Provide one completely assembled wall area, as shown in the Construction Documents, installed with all related accessories, in composite configurations and representative of the design as shown on the Drawings.
   1. Extent of mockup shall be the same as that which will be provided in the final work.

2. Mockup shall be installed simulating actual construction conditions, including actual structural supports and connections. Use means, methods and techniques proposed for final installation.
3. Locate mockup in location as directed by the Architect.
4. Personnel assembling mockup shall be the same personnel that will perform the actual work at the project site.]

D. [Pre-Construction Compatibility and Adhesion Testing: Submit to joint sealant manufacturer samples of material that will contact or affect joint sealants for compatibility and adhesion testing as indicated below:
1. Use test methods standard with manufacturer to determine of priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
a. Perform tests under normal environmental conditions that will exist during actual installation.]

E. Pre-Installation Inspection: Installer to contact manufacturer of the terra cotta panel rain screen system Owner and Architect, prior to installation of terra cotta panel rain screen system if site conditions adverse to proper installation of the system exist.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect components from adverse job conditions prior to installation.

B. Protect components from other trades after installation.

C. Storage:
1. Store components on platforms or pallets, covered with tarpaulins or other suitable weather-tight ventilated covering. Store components so that water accumulations will drain freely.
2. Do not store terra cotta panels in contact with other materials that might cause staining, surface damage, or other deleterious effect.
3. Do not stack platforms or pallets one on top of another.

D. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

E. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

F. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

1.6 FIELD CONDITIONS

A. Cold Weather: Perform work in accordance with ACI 530.1 current edition.

B. Hot Weather: Perform work in accordance with ACI 530.1 current edition.

C. At end of the working day, or during rainy weather, cover masonry work exposed to weather with waterproof coverage and securely anchor as necessary.

D. Protection: Adequately protect and do not damage existing construction to remain.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with requirements, manufacturer offering terra cotta penal rain screen system that may be incorporated in the work include the following;
   1. TerraClad™ by Boston Valley Terra Cotta USA (toll free 88.214.3655, tel. 716.649. 7490 – www.boston valley.com)
   2. ALPHATON Terracotta Rainscreen by Shildan Group (www.shildan.com)
   3. Terra5 by Cladding Corp (www.claddingcorp.com)

2.2 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
   1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

2.3 MATERIALS

A. Hollow terra cotta panels complying with the following:
   1. Finish: [Standard]
   2. Size: [As indicated on Drawings]
   3. Color: [To be selected]

B. Fasteners, clips, and vertical or horizontal track: In accordance with manufacturer's recommendations to meet performance criteria specified.

C. Vertical track:
   1. Aluminum alloy 6105 T5, mill finished.

D. Horizontal Track:
   1. Aluminum alloy 6063 T6, mill finished.

E. Flashing, Trim and other Accessories: Shop-fabricated, corrosion-resistant type capable of complying with the performance criteria specified and designed to allow adjustments of system prior to being permanently fastened.

F. Supporting system fastening method: Pre-engineered aluminum track, and clip, complying with the following:
   1. Panels fastened at head grooves and base channels using aluminum clips inserted into the track.
   2. The aluminum track is fastened to the building wall system as shown on the Construction Documents or Installation Contractor's Shop Drawings.
   3. The replacement of damaged panels, particularly in the field, must be possible using simple methods and shall not require special tools nor damage the surrounding panels.
   4. Silicone gaskets shall be colored black, unless specified by the Architect to match the panel color.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Terra cotta panel rain screen system installer to examine conditions affecting the work of this Section at site. If any conditions exist that would be detrimental to proper installation of terra cotta panel rain screen system, installer is to notify Architect and General Contractor / Construction Manager in writing.

B. Correct conditions detrimental to proper and timely completion of this work before proceeding with installation.

3.2 INSTALLATION, GENERAL

A. Do not install broken, chipped or cracked panels.

B. Isolate aluminum surfaces from direct contact to steel, cementitious, and dissimilar materials with high-impact plastic shims, paint or membrane.

C. Install terra cotta panel rain screen system to wall assembly as specified in accordance with the approved shop drawings and their manufacturer's instructions.

D. [Conceal fasteners.]

E. Place terra cotta panels in [stack bond] to lines and levels, plumb, with uniform, parallel joints, in accordance with their manufacturer's instructions.
   1. Use caution to prevent damage to terra cotta panels.
   2. When field-cutting, use caution to ensure that cuttings do not remain on exposed surfaces, Cut edges shall be sharp, without spalling.
   3. Cutting shall be performed with a diamond tipped wet saw.

F. Ensure that assembly is plumb, level and free of warp or twist; maintain dimensional tolerances and alignment with adjacent work.

G. Built-in work:
   1. As work progresses, build in flashing and other items.
   2. Where applicable, remove protection film from finished aluminum surfaces.

3.3 TOLERANCES

A. Tolerances: Accurately align and locate components to column lines and floor levels; adjust work to conform to the following tolerances:.
   1. Plumb: 1/8-inch in 10 feet; ¼-inch in 40 feet; non-cumulative.
   2. Level: 1/8-inch in 20 feet; ¼-inch in 40 feet; non-cumulative.
   3. Alignment: Limit offset to 1/16-inch where surfaces are flush or less than ½-inch out of flush, and separated by less than 2 inches (by reveal or protruding work); otherwise limit offsets to 1/8-inch.
   4. Location: 3/8-inch maximum deviation from measured theoretical location (any member, and location).
   5. Lipping between units: 1/16-inch maximum.
   6. Finished work shall be viewed from a distance of 15 feet per ASTM C216.

3.4 REPAIRING, POINTING, AND CLEANING

A. Clean soiled surfaces using materials which will not harm terra cotta panels or adjacent materials, as recommended by the terra cotta panel manufacturer (clean with mild detergent using a natural bristle brush, starting from top of building to the bottom). Use non-metallic tools in cleaning operations. Pressure washer not to exceed 1200 psi.

B. Upon completion of installation, remove protective coatings or coverings and clean aluminum surfaces, exercising care to avoid damage of finish.

C. Remove excess sealant compounds, dirt or other foreign substances.

D. Remove and replace terra cotta panels that are broken, chipped, cracked, abraded or damaged during construction period. Reinstall in accordance with their manufacturer's instructions.

END OF SECTION 04 21 29

SECTION 04 22 00 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

SCHEDULE 0 - SUMMARY

A. Section Includes:
   1. Concrete masonry units.
   2. Mortar and grout.
   3. Steel reinforcing bars.
   4. Masonry-joint reinforcement.
   5. Embedded flashing.
   6. Miscellaneous masonry accessories.
   7. Masonry-cell fill.

B. Related Requirements:
   1. Section 03 10 00 "Concrete Forms and Accessories" for installing dovetail slots for masonry anchors.
   2. Section 05 10 00 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
   3. Section 07 19 00 "Water Repellents" for water repellents applied to unit masonry assemblies.
   4. Section 07 62 00 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.
   5. Section 08 95 16 "Wall Vents" for wall vents (brick vents).

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:
   1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
   2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of all reinforced walls at ¼” per ft scale.
   3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection:

1. Colored mortar.
2. Weep holes/vents.

D. Samples for Verification: For each type and color of the following:
   1. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: For each type and size of the following:
   1. Masonry units.
      a. Include data on material properties and material test reports substantiating compliance with requirements.
   2. Cementitious materials. Include name of manufacturer, brand name, and type.
   3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
   4. Grout mixes. Include description of type and proportions of ingredients.
   5. Reinforcing bars.
   6. Joint reinforcement.
   7. Anchors, ties, and metal accessories.

C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
   1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
   2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

1.7 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
   1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
   1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
   2. Protect sills, ledges, and projections from mortar droppings.
   3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
   4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.
   1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to TMS 602/ACI 530.1/ASCE 6.

2.3 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.

2.4 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
   1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
   2. Provide bullnose-edged units for outside corners unless otherwise indicated.

B. CMUs: ASTM C 90.
   1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
   2. Density Classification: Lightweight except at exposed units at exterior walls.
   3. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.
   4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.

2.5 CONCRETE AND MASONRY LINTELS

A. General: Provide one of the following:

B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.6 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
   1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Aggregate for Mortar: ASTM C 144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
   2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.

E. Aggregate for Grout: ASTM C 404.

F. Water: Potable.

2.7 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

C. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A 951/A 951M.
   1. Interior Walls: Hot-dip galvanized carbon steel.
   2. Exterior Walls: Hot-dip galvanized carbon steel.
   3. Wire Size for Side Rods: 0.148-inch diameter.
   4. Wire Size for Cross Rods: 0.148-inch diameter.
   5. Spacing of Cross Rods: Not more than 16 inches o.c.
   6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

2.8 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches into masonry but with at least a 5/8-inch cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated:
   1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M, with ASTM A 153/A 153M, Class B-2 coating.
   2. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
   3. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
   1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch-diameter, hot-dip galvanized steel wire.
   2. Tie Section: Triangular-shaped wire tie made from 0.187-inch- diameter, hot-dip galvanized steel wire.

2.9 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
   1. Do not use calcium chloride in mortar or grout.
   2. Use portland cement-lime mortar unless otherwise indicated.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
   1. For reinforced masonry, use Type S.
   2. For interior nonload-bearing partitions, use Type N.

D. Grout for Unit Masonry: Comply with ASTM C 476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
   2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2500 psi.
   3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
   1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
   2. Verify that foundations are within tolerances specified.
   3. Verify that reinforcing dowels are properly placed.
   4. Verify that substrates are free of substances that would impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:
   1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
   2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
   3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:
   1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.

2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. Joints:
1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with solid grout unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:
   1. Bed face shells in mortar and make head joints of depth equal to bed joints.
   2. Bed webs in mortar in all courses of piers, columns, and pilasters.
   3. Bed webs in mortar in grouted masonry, including starting course on footings.
   4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

C. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
   1. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
   2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:

1. Anchor masonry with anchors embedded in masonry joints and attached to structure as detailed on the drawngs.

3.8 LINTELS

A. Provide lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

B. Provide concrete or masonry lintels where indicated. Provide loose steel lintels, concrete, or masonry lintels where lintel no type is specified.

C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.9 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
   1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
   2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
   1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
   2. Limit height of vertical grout pours to not more than 60 inches.
   3. Do not use mortar to fill cmu cores. Use of mortar is cause for immediate rejection and replacement of the work.

3.10 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Special inspections according to Level [**B**] [**C**] in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

H. Prism Test: For each type of construction provided, according to ASTM C 1314 at 28 days.

3.11 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.

5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

END OF SECTION 042200

SECTION 05 12 00 – STRUCTURAL STEEL

PART 1 - GENERAL

1.1 SCOPE

A. The extent of Structural Steel is as shown on the Contract Documents and as herein specified. The General and Supplementary Conditions and Division 1 Specification sections apply to work of this section.

1.2 GENERAL PROVISIONS

A. Standard Specifications and Codes issued by professional organizations and governmental agencies are specified hereinafter by basic designations and only the latest editions and revisions thereto shall apply to the work of this Section.

B. Applicable Standard Specifications and Codes:

1. The 2020 New York State Building Code.

2. Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings issued by the American Institute of Steel Construction. (AISC).

3. AWS D1.1 “Structural Welding Code – Steel” issued by the American Welding Society (AWS).

4. “Specification for Structural Joints Using ASTM A325 or A490 Bolts” issued by the AISC.

5. Painting Manual, Volume 2, “Systems and Specifications”, as issued by the Steel Structures Painting Council (SSPC).

6. "Code of Standard Practice for Steel Buildings and Bridges" as issued by the AISC.

C. In case of any conflict between the referenced standards and these specifications, the one having more stringent requirements shall prevail.

D. Coordination: Carry out the work of this Section in coordination and cooperation with contiguous work of other trades and/or Contracts involved.

1.3 SHOP DRAWINGS

Retain "Preinstallation Conference" Paragraph below if Work of this Section is extensive or complex enough to justify a preinstallation conference.

A. Submit Shop Drawings for the Architect's approval in accordance with the provisions of Section 013300.

B. The submittals shall include the following:

1. Erection plans: Shall be submitted for approval as early as possible.

2. Standard and special details: Submit standard and special details for approval as soon as possible.

3. Shop drawings shall indicate type, size and dimensions of all welds, and shall include details of the surface preparation and shop painting.

4. The details shall be made in such a way as to avoid having steel connections, bracing, etc. interfere with architectural details or in any way reduce the areas of shafts, openings, clearances, etc.

5. Shop drawings submitted electronically shall follow proper channels of submission as established with the owner and the design team. In addition, provisions of the General Conditions, as well as Section 013300 shall be followed as established for hard copy submissions. Shop drawings shall be submitted under a separate cover, include the title block and clearly identify the project on each drawing. Provide all other pertinent information and include the general contractor's review comments and review status on the electronic submission.

C. No fabrication shall be undertaken until respective shop drawings are marked "No Exception Taken" or "No Exception Except as Noted".

1.4 ALTERATIONS AND ADDITIONS TO EXISTING STEEL STRUCTURE

A. The Contractor shall verify existing conditions before submitting shop drawings for approval, including:

1. Dimensions and elevations.

2. Sizes.

3. Acceptable condition (not deteriorated or damaged).

B. The Contractor shall notify the Architect of any varying or interfering conditions affecting the alterations or additions so that the design may be adjusted to suit.

C. The Contractor shall carefully fit new connections to safe and acceptable tolerances.

D. Cutting of existing steel shall be done with extreme care. Do not over cut. Shore and brace whenever safety is questionable.

Verify available warranties and warranty periods for fire extinguishers with manufacturers.

PART 2 - PRODUCTS

See Editing Instruction No. 1 in the Evaluations for cautions about named manufacturers and products. For an explanation of options and Contractor's product selection procedures, see Section 01 60 00 "Product Requirements."

2.1 MATERIALS

A. Structural Steel shall conform to the following unless otherwise noted:

1. Channels, angles, plates and bars – ASTM A36

2. Round HSS – ASTM A53, Grade B

3. Square and rectangular HSS - ASTM A500, Grade B

4. HP shapes – ASTM A572, Grade 50

5. All others – ASTM A992, Grade 50

B. Bolts shall be ASTM A325, or A490. A307 may be used, if approved by the Structural Engineer of Record.

C. High Strength Bolts:

1. Bolts: Use ASTM A325 or A490 bolts manufactured by Infasco or approved equal. ASTM F1852 twist-off type tension control bolts produced by manufacturer may be used if approved by the Structural Engineer of Record.

2. Hardened washers: Use ASTM F436 washers manufactured by Infasco or approved equal.

3. Heavy hex nuts: Use only ASTM A563 heavy hex nuts manufactured by Infasco or Unytite Inc.

4. Galvanized Bolts: Where shown or noted as galvanized, bolts nuts and washers shall be hot-dip galvanized in compliance with ASTM A153. Nuts shall be lubricated in accordance with ASTM A563. Rotational capacity tests shall be performed on each assembly lot.

D. Filler Metal:

1. Electrodes: As required for matching base metal as specified in AWS “Structural Welding Code-Steel”.

2. The electrodes and flux used for submerged arc welding shall be provided by the same manufacturer. The flux shall be free of contamination from dirt, mill scale and other foreign material. Fused flux used in welding shall not be reused.

3. Filler metal for welding of new to existing steel shall be determined based on the test results conducted by a testing laboratory approved by the Structural Engineer of Record.

E. Paint for Shop Coat, except as otherwise required for compatibility with finish paints as specified in Section 099000, shall be “Azeron H.S. Primer No. 88-555” by Tnemec, or a comparable suitable product by DuPont or Glidden.

PART 3 - EXECUTION

3.1 DESIGN AND WORKMANSHIP

A. Unless otherwise specified or indicated, the design, fabrication and erection of steel work included in this Contract shall conform to the Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings, by the American Institute of Steel Construction, and the regulations of the Building Code, including all amendments made thereto, whichever is the more restrictive.

B. Existing Conditions:

1. Visit the project site and advise the Architect of any discrepancy or conflict. Field verify existing construction requirements, existing conditions, restrictions and clearances which may affect structural steel erection.

2. Examine the substrates, adjoining construction and the conditions under which the work is to be installed. Do not proceed until unsuitable conditions have been corrected. Consider all conditions which will affect satisfactory erection of the structural steel.

C. Erection:

1. Check the alignment and elevations of all column supports and location of all anchor bolts with transit and level instruments before starting erection. Notify and obtain Structural Engineer of Record's approval of methods proposed for correcting errors prior to proceeding with corrections.

2. Drift pins may be used only to align the erected parts. They shall not be used in such manner as to distort or damage the steel.

3. Make all necessary provisions for temporary shoring and bracing with connections of sufficient strength to sustain the imposed loads and for completion of erection where structural members are temporarily left out for erection at a later date.

4. Base and Bearing Plates:
   a. Clean concrete and masonry bearing surfaces of deleterious materials and roughen as necessary to provide adequate bond. Clean bottom surface of base and bearing plates immediately prior to erection.
   b. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
   c. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims. Cut off protruding parts flush with edges of base or bearing plates prior to packing with grout.
   d. Pack grout solidly between bearing surfaces and steel or plates. Ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure as per manufacturer's specifications.

3.2 HIGH STRENGTH BOLTING

A. High Strength Bolts shall be installed as per "Specification for Structural Joints using ASTM A325 or A490 Bolts".

3.3 WELDING

A. Materials and Workmanship:

1. Welding shall be done in accordance with the Building Department and Fire Department Regulations and the requirements of the AWS “Structural Welding Code-Steel”, referenced herein.

2. Peening: Used only after permission for its use is obtained from the Architect.

3. Protection, storage and drying of welding electrodes shall be as specified in AWS “Structural Welding Code-Steel”.

4. Groove welds shall be complete penetration welds unless otherwise shown.

B. Welders and Welding Operators:

1. Welders and welding operators to be employed for this work must be qualified as prescribed in AWS “Structural Welding Code-Steel” and carry current certification as required by the Department of Buildings.

2. All costs for qualifying welders will be borne by the Contractor.

3.4 SURFACE PRAPARATION AND PAINTING

A. All steel shall be cleaned in accordance with SSPC SP-2 "Hand Tool Cleaning", except as specified below for "Architectural Steel”.

B. After fabrication, steel shall receive a shop coat of paint to provide 2.0 - 4.0 mils dry film thickness, except for the following:

1. Members to be encased in concrete.

2. Areas within 2" of field welds.

3. Contact surfaces of high-strength bolted connections.

4. Surfaces receiving shear studs rebar dowels, etc.

5. Milled surfaces (protect with an approved rust- inhibitive coating readily removable prior to erection, or of a type not requiring removal).

6. Members which will receive cementitious fireproofing.

7. Members to be galvanized.

C. After erection all damaged areas in the shop-coat, loosened scale, rust, exposed surfaces of bolts, nuts and washers, and all field welds and unpainted areas shall be cleaned to the same standards as for the shop coat and spot painted with the same paint used for the shop coat, at same film thickness.

D. Steel surfaces which will be inaccessible after erection and are not concrete encased shall be painted prior to erection with an additional coat of shop paint.

END OF SECTION 05 12 00

SECTION 05 31 00 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Roof deck.
2. Composite floor deck.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
2. Section 051200 "Structural Steel Framing" for shop- and field-welded shear connectors.
3. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.2 ACTION SUBMITTALS

A. Product Data::

1. Composite floor deck.

B. Shop Drawings:

1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.3 INFORMATIONAL SUBMITTALS

A. Certificates:
1. Welding certificates.
2. Product Certificates: For each type of steel deck.

B. Test and Evaluation Reports:
1. Product Test Reports: For tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
   a. Power-actuated mechanical fasteners.
   b. Acoustical roof deck.

2. Research Reports: For steel deck, from ICC-ES showing compliance with the building code.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

D. Qualification Statements: For welding personnel and testing agency.

1.5 QUALITY ASSURANCE

E. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

F. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

G. Electrical Raceway Units: Provide UL-labeled cellular floor-deck units complying with UL 209 and listed in UL's "Electrical Construction Equipment Directory" for use with standard header ducts and outlets for electrical distribution systems.

H. FM Approvals' RoofNav Listing: Provide steel roof deck evaluated by FM Approvals and listed in its RoofNav for Class 1 fire rating and Class 1-90 windstorm ratings. Identify materials with FM Approvals Certification markings.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Do not overload deck during construction by workers or storage of materials.

C. Rusted, crimped or bent deck shall not be installed in the work. Replace damaged deck with new material at no additional cost to the owner.

D. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

B. Fire-Resistance Ratings: Comply with ASTM E119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ROOF DECK (NOT USED)

A. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:

1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Deck Profile: As indicated.
3. Profile Depth: As indicated.
4. Design Uncoated-Steel Thickness: As indicated.
5. Span Condition: Triple span or more.
6. Side Laps: Overlapped.

2.3 COMPOSITE FLOOR DECK

A. Composite Floor Deck: Fabricate panels, with integrally embossed or raised pattern ribs and interlocking side laps, to comply with "SDI Specifications and Commentary for Composite Steel Floor Deck," in SDI Publication No. 31, with the minimum section properties indicated, and with the following:
1. Galvanized-Steel Sheet: ASTM A653/A653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Profile Depth: As indicated.
3. Design Uncoated-Steel Thickness: As indicated.
4. Span Condition: Triple span or more.

2.4 ACCESSORIES

A. Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.

C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.

D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.

E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.

F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.

G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.

H. Flat Sump Plates: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck. For drains, cut holes in the field.

I. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch-wide flanges and recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.

J. Galvanizing Repair Paint: ASTM A780/A780M.

K. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.

B. Install temporary shoring before placing deck panels if required to meet deflection limitations.

C. Locate deck bundles to prevent overloading of supporting members.

D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

1. Align cellular deck panels over full length of cell runs and align cells at ends of abutting panels.

E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.

H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.

I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 INSTALLATION OF ROOF DECK

A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:

1. Weld Diameter: 5/8 inch, nominal.
2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.

B. Mechanical Fasteners: Deck shall be attached to supporting members as noted on the Contract Drawings.

1. Spacing of fasteners shall not exceed 12 inches along each support, unless noted otherwise on the Contract Drawings.
2. Attachment shall be done immediately after the deck units are aligned.
3. Deck units shall have side laps fastened at 36 inches on center or at midspan (whichever is smaller) for spans greater than 5 feet unless otherwise specified on the Contract Drawings.
4. Fasten deck to perimeter members parallel to deck span at 36 inches on center maximum for spans greater than 5 feet unless otherwise specified on the Contract Drawings.

C. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches and as noted on the Contract Drawings.

D. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Lapped 2 inches minimum.

E. Roof Sump Pans and Sump Plates: Install over openings provided in roof deck and mechanically fasten flanges to top of deck. Space mechanical fasteners not more than 12 inches apart with at least one fastener at each corner.

1. Install reinforcing channels or zees in ribs to span between supports and mechanically fasten.

F. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. mechanically fasten to substrate to provide a complete deck installation.

1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.

G. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

H. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified in Section <**Insert Section number**> "<**Insert Section title**>."

3.4 INSTALLATION OF FLOOR DECK

A. Fasten floor-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated and as follows:

1. Weld Diameter: 5/8 inch, nominal.
2. Weld Spacing: Weld edge ribs of panels at each support. Space additional welds an average of 12 inches apart, but not more than 18 inches apart.
3. Weld Spacing: Space and locate welds as indicated.

B. Mechanical Fasteners: Deck shall be attached to supporting members as noted on the Contract Drawings.

1. Spacing of fasteners shall not exceed 12 inches along each support, unless noted otherwise on the Contract Drawings.
2. Attachment shall be done immediately after the deck units are aligned.
3. Deck units shall have side laps fastened at 36 inches on center or at midspan (whichever is smaller) for spans greater than 5 feet unless otherwise specified on the Contract Drawings.
4. Fasten deck to perimeter members parallel to deck span at 36 inches on center maximum for spans greater than 5 feet unless otherwise specified on the Contract Drawings.

C. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of one-half of the span or 36 inches and as noted on the Contract Drawings.

D. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:

1. End Joints: Butted.

E. Pour Stops and Girder Fillers: Weld steel sheet pour stops and girder fillers to supporting structure according to SDI recommendations unless otherwise indicated.

F. Wet concrete stops at slab edge shall be upturned to top surface of slab to contain wet concrete. Provide stops of sufficient strength to remain stationary under wet concrete and construction work without distortion.

G. Floor-Deck Closures: Weld steel sheet column closures, cell closures, and Z-closures to deck, according to SDI recommendations, to provide tight-fitting closures at open ends of ribs and sides of deck.

H. Unless noted otherwise on Contract Drawings, reinforce steel deck openings less than 10 inches in size with 2x2x1/4 inch steel angles. Place framing angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and mechanically attach to deck at each flute.

I. Install 6 inch minimum wide sheet steel cover plates, of same thickness as deck, where deck changes direction. Mechanically attach at 6 inches on center maximum.

3.5 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

B. Repair blow-holes at welds with 18 gage plates welded in place. Replace entire sections of deck where holes cannot be satisfactorily repaired

3.6 HANGERS FOR MISCELLANEOUS EQUIPMENT

A. Do not attach hangers for ductwork, mechanical piping, or ceilings directly to metal deck.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing agency to perform tests and inspections as noted below along with inspection schedule items included in the Contract Drawings. Testing agency shall prepare test and inspection reports and submit to the Owner and the Owner’s consultants.

B. Inspect condition of deck units for damage and corrosion. Report deficiencies.

C. Inspect size, spacing, and quality of connections of deck to structure and at side laps for conformance with Contract Drawings. Report deficiencies.

D. Deck: Inspect deck at welded connections. Connections do not conform to specifications where deck is not intact after welding and where blow holes occurred.

E. Field welds will be subject to inspection.

F. Prepare test and inspection reports.

G. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

END OF SECTION 053100

SECTION 05 40 00 - COLD FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SCOPE

A. All light gage steel studs, track, joists, trusses, bridging and related accessories as indicated on the Contract Drawings and specified herein, plus all supplementary parts necessary to complete light gage metal work, whether or not definitely shown on drawings or specified herein.

B. Related work specified elsewhere:

1. Division 09 – Finishes

1.2 QUALITY ASSURANCE

A. Inspection and Quality Control:
1. Contractor shall provide effective full-time quality control over all fabrication and erection activities.
2. As directed by Architect, Owner's testing agency may inspect the maintenance of a quality control program, including spot checking weldments and welding procedure in accordance with A.W.S. standards.
3. Steel framing manufacturer shall provide a qualified representative for periodic on-site review of fabrication and installation in accordance with manufacturer's recommendations.
4. Inspection by Owner's testing agency is not intended to be comprehensive or complete.
5. Full responsibility for quality control shall remain with Contractor.

B. Standards:
1. Work shall meet the requirements of the latest edition of the following standards.
   a. The Building Code of State of New York.
   b. American Iron and Steel Institute (A.I.S.I.) Design and Cold Formed Steel Structural Members.
   c. American Welding Society (A.W.S. D.1.3, Structural Welding Code -- Sheet Steel).
   d. American Society for Testing and Materials (A.S.T.M.).
   e. American Institute of Steel Construction (A.I.S.C.) Manual of Steel Construction.
   f. All pertinent Federal, State and Local codes.
2. The most stringent requirements shall govern in conflicts between specified codes and standards.
   a. Erection plans showing locations and marks of members. Fabrication drawings showing details at every member.
   b. Member gages, spacings and sizes.
   c. Shop and field assembly details including cuts and connections.
   d. Type and location of welds, bolts and other fastening devices.

1.3 PRODUCT HANDLING

A. Protection:

1. Upon delivery, material shall be protected from rain and snow by impervious covering or shelter.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Framing members shall be manufactured and supplied by Marino Ware or approved equal and be of the type and size as shown on the plans.

2.2 MATERIAL

A. Members:
1. Members shall be formed from steel having a G-60 galvanized coating meeting the requirements of ASTM C-955.
2. Studs and Joists of 12,14 and 16 gage thicknesses shall be formed from steel conforming to ASTM A653 HSLAS Type A, with a minimum yield of 50,000 psi.
3. Except as specified above, all steel shall conform to ASTM A653 SS Grade with a minimum yield of 33,000 psi.

B. Properties:
1. The physical and structural properties listed Marino Ware shall be considered the minimum permitted for framing members. Specifically, the following minimum properties, calculated in accordance with the latest A.I.S.I. Specification shall be provided: Ix (in.4), Area (in.2), rx (in.), Fy (KSI), Resisting Moment (in.-lb.).

C. Substitutions:
1. Any substitutions must be approved in writing ten days prior to bid date by the Architect.

2.3 FABRICATION

A. Framing components may be preassembled into panels prior to erecting. Prefabricated panels shall be square, with components attached in a manner as to prevent racking.

B. Framing components shall be cut squarely for attachment to perpendicular members, or as required for an angular fit against abutting members. Members shall be held positively in place until properly fastened.

C. Provide insulation equal to that specified elsewhere in double jamb studs and double header members which will not be accessible to the insulation contractor.

D. Axially Loaded Studs:
1. Studs shall have full bearing against inside track web, prior to stud and track attachment.
2. Splices in axially loaded studs shall not be permitted.

EXECUTION

3.1 SURFACE CONDITIONS

A. Inspection:
1. Prior to installation inspect work of all other trades. Verify that all such work is complete an accurate to the point where this installation may properly commence in strict accordance with framing shop drawings.

B. Discrepancies:
1. Immediately notify Architect of all discrepancies.
2. Do not proceed with installation in areas of discrepancies until such discrepancy has been fully resolved.

3.2 ERECTION

A. Walls:
1. Erect framing and panels plumb, level and square in strict accordance with the approved shop drawings.
2. Handling and lifting of prefabricated panels shall be done in a manner as to not cause distortion in any member.
3. Track shall be securely anchored to the supporting structure as shown on the fabrication and erection drawings.
4. At track butt joints, abutting pieces of track shall be securely anchored to a common structural element or they shall be butt-welded or spliced together.
5. Studs shall be plumbed, aligned and securely attached to the flange or webs of both upper and lower tracks.
6. Wall stud bridging shall be attached in a manner to prevent stud rotation. Bridging rows shall be spaced according to the manufacturer's recommendation. Without supportive data, the minimum bridging shall be at mid-height of walls. Installation of bridging must be completed before any loads are applied to the system.
7. Temporary bracing shall be provided until erection is completed.

B. Cold Formed Steel Joists:
1. Joists shall be located directly over bearing studs or a load distribution member shall be provided at the top track.
2. Provide web stiffeners at reaction points where indicated by plans.
3. Joist bridging shall be installed at 3'-0" o.c. maximum intervals.
4. Proper attachments of diaphragm rated products, such as plywood or metal deck, will prevent rotation of the compression flange of the joists. These may be used in lieu of the top flat strap. Installation of these products and the balance of the mechanical bridging components must be completed before any loads are applied to the joists.
5. Install 16 gage solid bridging in first two and last two joist spaces. Starting at third joist space, install V-bar bridging at bottom, extending for 10'-0" run. Follow with solid bridging in one space. Repeat to completion, with each 10'-0" run of strap bridging followed by one space of solid bridging.
6. Solid bridging shall not be less than 2" maximum reduction to section depth.
7. End blocking shall be provided where joist ends are not otherwise restrained from rotation.

3.3 CONNECTIONS

A. Provide close fitting joints cut flush with adjacent structural steel supports, cut, drill, punch and tap for the installation and attachment of other work to miscellaneous metal work as follows:

1. Joints:
   Make joints as strong and rigid as adjoining sections. Make welds continuous along entire line of contract, except where spot welding is indicated. Grind exposed weld flush and smooth. Where bolted or riveted connections are indicated, such connection may be welded. Seat studs squarely in track with stud web and flange abutting track web.
2. Welding:
   Perform welding in accordance with AWS D1.1 and AWS D1.3.
3. Screws: Screws and screwed connections shall conform to the AISI Cold-formed Steel Specification.

B. Anchorage:
   Except where otherwise specified, members shall be fastened to structural steel by welded or bolted connections and to masonry with toggle bolts. Fastening to wood plugs in concrete or masonry will not be permitted. Drill holes for toggle bolts to the exact diameter of the bolt, using a rotary drill for concrete and a percussion drill for other masonry. Screws shall be threaded full length to the head of the screw.

3.4 WASTE MANAGEMENT

A. Coordinate with Division 01.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 05 40 00

SECTION 05 51 33 23 - ALTERNATING TREAD ALUMINUM STAIRS/LADDER

PART 1- GENERAL

1.1 SCOPE OF WORK

Fabricate and Install metal alternating tread stair assemblies in accordance with the requirements set forth in this section.

1.2 ADDITIONAL WORK INCLUDED IN THIS SECTION

A. Field measurements of alternating tread device installation sites and verification of vertical distance between floors.
B. Other as required_____

1.3 RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

Cross over and landing platforms used with alternating tread stairs are addressed in section 05 51 36.

1.4 SUMMARY:

A. Provide all material, labor, equipment and services and perform all operations necessary or required for the work of this section, in accordance with the Drawings and Specifications, and including fabrication and installation of alternating tread aluminum Stairs.

B. Related work specified elsewhere includes but is not limited to:

1. Conventional Metal Stairs in another Division 5 section
2. Metal Fabrications in another Division 5 section
3. Cross over and landing platforms used with alternating tread stairs are addressed in section 05 51 36.

1.5 REFERENCES

National Association of Architectural Metal Manufacturers (NAAM)

A. NAAMM, STANDARD AMP 510-92 Metal Stairs Manual 5th Edition

Aluminum Association

B. Aluminum standards and data, latest Edition

1.6 PERFORMANCE REQUIREMENTS:

A. Alternating Tread Stair Treads: shall be capable of withstanding a single concentrated 1000 pound load without permanent deformation; or 100 pounds per square foot or 300 pounds on an area of 4 square inches without exceeding the allowable working stress of the material.

B. Alternating Tread Stair Guard and Handrail: shall be capable of withstanding a single concentrated load of 200 pounds or a uniform load of 50 pounds per linear foot applied in any direction at any point on the rail without exceeding the allowable working stress of the material.

C. Alternating Tread Stair Stringers: shall be capable of withstanding a single concentrated load of 1000 pounds at any point on the stair without permanent deformation; or a uniform live loading of 100 pounds per square foot applied in a downward direction to all tread surfaces or a 300 pound load on an area of 4 square inches without exceeding the allowable working stress of the material.

1.7 CONSTRUCTION REQUIREMENTS:

A. Cast Aluminum Treads, Landings, and Mounting Base: shall be shielded metal arc welded to a single extruded box-like stringer.

B. Tread Castings: shall have integrally cast handrail support arms which are precision machined and welded to continuous aluminum handrails.

C. Pedestrian Surfaces: shall be cast with skid resistant surfaces and all treads shall have upturned integrally cast skid barriers.

D. Riser Spacing: shall be equally spaced to within 3/16" for adjacent and to within 3/8" for any two non-adjacent risers on a stair.

E. Guards and Handrails: shall be contoured for body guidance and underarm support, and shall have inclined hand side portions for free sliding of the hands unimpeded by the handrail supports.

F. Cast Aluminum Foot Divider: shall be an integral part of the landing and shall form a support for a rubber bumper strip.

1.8 DIMENSIONS:

A. Alternating Tread Stair Angle: 68 degrees from horizontal as specified in the drawings.

B. Vertical Drop: the change in elevation, as shown in the drawings, between the upper finished floor surface where the top landing will be attached and the lower finished floor surface where the base of the alternating tread stair will be secured.

1.9 SUBMITTALS:

Dimensional Prints: shall be submitted for approval prior to fabrication.

1.10 DELIVERY STORAGE AND HANDLING

A. Deliver materials to the job-site in good condition and properly protected against damage to finished surfaces.
B. Store material in a location and manner to avoid damage. Do not stack components. Lay out components on firm foundation material such that bending can not occur.
C. Store metal components in a clean dry location, away from uncured concrete, cement, or masonry products, acids, oxidizers, rain water, or any other chemical or substance that might damage the material or finish.
D. Plan work and storage locations to keep on-site handling to a minimum.
E. Exercise particular care to avoid damage to material finishes or unprotected surfaces when handling.

PART 2-PRODUCTS

2.1 ACCEPTABLE MANUFACTURER:

A. Lapeyre Stair, Inc.
5117 Toler St.
Harahan, LA.
70123; 1-(800)-
535-7631 or 1-
(504)-570-6209.

B. Precision Ladders, LLC
5501 Jeffery Lane
Morristown, TN 37816-2279
(800)-225-7814

C. Platforms and Ladders
Diverse Supply, Inc.
360 Central Ave. Suite #800
St. Petersburg, FL 33701
(888)-802-3651

2.2 MATERIALS:

A. Landings, Treads and Foot Castings: Aluminum alloy F356F

B. Guards/Handrails:
   1. Aluminum Alloy 6063-T4 2. 1-1/2" Φ x 1/8" Tube
C. Central Stringer:
   1. Aluminum Alloy 6063-T52
   2. 1-3/4" x 4" x 1/8" Box Shape

D. Miscellaneous Materials:
   1. Rubber Spine: Hollow neoprene strip
   2. Bolts: Landing to Structure, ASTM A307, 1/2" diameter
   3. Nuts: ASTM A563
   4. Washers: ASTM F844

2.3 FINISH:

Natural Finish

2.4 FABRICATION:

A. General: Fabricate alternating tread aluminum stairs to conform with performance and construction requirements, and in accordance with approved shop drawings or dimensional prints. Fabricate and shop-assemble to greatest extent possible.

B. Fabricate gas metal arc welded and/or gas tungsten arc welded alternating tread aluminum stairs using the specified materials.

PART 3- EXECUTION:

3.1 PREPARATIONS:

A. Coordination: Coordinate start and installation of aluminum alternating tread stairs with all other related and adjacent work. Installation shall not start until the construction has progressed to the point that weather conditions and remaining construction operations will not damage stair installation.

B. Verification: Verify that dimensions and angle are correct and that substrate is in proper condition for alternating tread stair installation. Do not proceed with installation until all necessary corrections have been made.

3.2 INSTALLATION:

A. Prepare mounting holes.

B. Position alternating tread stair with top tread at same elevation as upper finished floor or roof surface.

C. Secure alternating tread stair with not less than 2 bolts or studs at top and with not less than 2 at bottom of stair.

3.3 CLEAN-UP:

Leave work areas clean and free of debris.

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SECTION 05 52 13 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 General Requirements, apply to this Section.

1.2 SUMMARY

A. This Section includes the following: Steel pipe and tube handrails and railing systems. (All interior and exterior railings unless noted otherwise)

1.3 DEFINITIONS

A. Definitions in ASTM E 985 for railing-related terms apply to this Section.

1.4 PERFORMANCE REQUIREMENTS

A. General: In engineering handrail and railing systems to withstand structural loads indicated, determine allowable design working stresses of materials based on the following:
   1. Aluminum: AA "Specifications for Aluminum Structures."
   2. Cold-Formed Structural Steel: AISI "Specification for the Design of Cold-Formed Steel Structural Members."
   3. Stainless Steel: ASCE “Specification for the Design of Cold-Formed Stainless Steel Structural Members.”

B. Structural Performance of Handrails and Railing Systems: Engineer, fabricate, and install handrails and railing systems to withstand the following structural loads without exceeding the allowable design working stress of the materials for handrails, railing systems, anchors, and connections. Apply each load to produce the maximum stress in each of the respective components comprising handrails and railing systems.
   1. Top Rail of Guardrail Systems: Capable of withstanding the following loads applied as indicated:
      a. Concentrated load of 200 lbf applied at any point and in any direction.
      b. Uniform load of 50 lbf per linear foot applied horizontally and concurrently with uniform load of 100 lbf per linear foot applied vertically downward.
      c. Concentrated and uniform loads above need not be assumed to act concurrently.
   2. Handrails Not Serving as Top Rails: Capable of withstanding the following loads applied as indicated:
      a. Concentrated load of 200 lbf applied at any point and in any direction.
      b. Uniform load of 50 lbf per linear foot applied in any direction.
      c. Concentrated and uniform loads above need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in engineering, fabricating, and installing handrails and railing systems to prevent buckling, opening of joints, overstressing of components and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.
   1. Temperature Change (Range): 120 deg F ambient 180 deg F material surfaces.

D. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 General Requirements.

B. Product data for mechanically connected handrails and railing systems, each kind of fitting, grout, anchoring cement, and paint products.

C. Shop drawings showing fabrication and installation of handrails and railing systems including plans, elevations, sections, details of components, and attachments to other units of Work.
   1. For installed handrails and railing systems indicated to comply with certain design loadings, include structural analysis data sealed and signed by the qualified professional engineer who was responsible for their preparation.

D. Samples for initial selection in the form of manufacturer's color charts showing the full range of colors available for those units with factory-applied color finishes.

E. Samples for verification of each type of exposed finish required, prepared on components indicated below that are of the same thickness and metal indicated for final unit of Work. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
   1. 6-inch-long sections of each distinctly different linear railing member including handrails, top rails, posts, and balusters.
   2. Fittings and brackets.

F. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project names, addresses, names of architects and owners, and other information specified.

G. Test reports from an independent testing agency evidencing compliance of handrails and railing systems with ASTM E 985.

1.6 QUALITY ASSURANCE

A. Single-Source Responsibility: Obtain handrails and railing systems of each type and material from a single manufacturer.

B. Engineer Qualifications: Professional engineer legally authorized to practice in the jurisdiction where Project is located and experienced in providing engineering services of the kind indicated for handrails and railing systems similar to this Project in material, design, and extent, and that have a record of successful in-service performance.

1.7 STORAGE

A. Store handrails and railing systems inside a well-ventilated area, away from uncured concrete and masonry and protected from weather, moisture, soiling, abrasion, extreme temperatures, and humidity.

1.8 PROJECT CONDITIONS

A. Field Measurements: Where handrails and railing systems are indicated to fit to other construction, check actual dimensions of other construction by accurate field measurements before fabrication; show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating handrails and railing systems without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.9 SEQUENCING AND SCHEDULING

A. Sequence and coordinate installation of wall handrails as follows:
   1. Mount handrails only on completed walls. Do not support handrails temporarily by any means not satisfying structural performance requirements.
   2. Mount handrails on plaster or gypsum board assemblies only where reinforced to receive anchors and where the location of concealed reinforcements has been clearly marked for benefit of Installer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering handrails and railing systems that may be incorporated in the Work include, but are not limited to, the following:
   1. Steel Pipe and Tube Railings:
      a. Humane Equipment Co.
      b. Wagner: R & B Wagner, Inc.

2.2 METALS

A. General: Provide metals free from surface blemishes where exposed to view in the finished unit. Exposed-to-view surfaces exhibiting pitting, seam marks, roller marks, stains, discolorations, or other imperfections on finished units are not acceptable.

B. Steel and Iron: Provide steel and iron in the form indicated, complying with the following requirements:
   1. Steel Pipe: ASTM A 53; finish, type, and weight class as follows:

a. Type F, or Type S, Grade A, standard weight (schedule 40), unless otherwise indicated, or another weight, type, and grade required by structural loads.

C. Brackets, Flanges, and Anchors: Cast or formed metal of the same material and finish as supported rails, unless otherwise indicated.

2.3 WELDING MATERIALS, FASTENERS, AND ANCHORS

A. Welding Electrodes and Filler Metal: Provide type and alloy of filler metal and electrodes as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of the type, grade, and class required to produce connections that are suitable for anchoring railings to other types of construction indicated and capable of withstanding design loadings.
   1. For steel railings and fittings, use plated fasteners complying with ASTM B 633, Class Fe/Zn 25 for electrodeposited zinc coating.

C. Fasteners for Interconnecting Railing Components: Use fasteners of same basic metal as the fastened metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
   1. Provide concealed fasteners for interconnecting railing components and their attachment to other work, except where otherwise indicated.

D. Cast-in-Place and Post-installed Anchors: Anchors of type indicated below, fabricated from corrosion-resistant materials, capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete, as determined by testing per ASTM E 488, conducted by a qualified, independent testing agency.
   1. Cast-in-place anchors.
   2. Chemical anchors.
   3. Expansion anchors.

2.4 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems indicated, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure, complying with performance requirements of FS TT-P-664.

B. Paint: Top coat to be Alkyd Gloss Level 5 MPI#81.

2.5 GROUT AND ANCHORING CEMENT

A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

B. Available Products: Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
   1. Nonshrink, Nonmetallic Grouts:
      a. B-6 Construction Grout; W.R. Bonsal Co.
      b. Diamond-Crete Grout; Concrete Service Materials Co.
      c. Supreme; Cormix Construction Chemicals.
      d. Sure-grip High Performance Grout; Dayton Superior Corp.
      e. Euco N-S Grout; Euclid Chemical Co.
      f. Five Star Grout; Five Star Products.
      g. Vibropruf #11; Lambert Corp.
      h. Crystex; L & M Construction Chemicals, Inc.
      i. Masterflow 928 and 713; Master Builders Technologies, Inc.
      j. Sealtight 588 Grout; W.R. Meadows, Inc.
      k. Sonogrout 14; Sonneborn Building Products--ChemRex, Inc.
      l. Kemset; The Spray-Cure Company.

2.6 FABRICATION

A. General: Fabricate handrails and railing systems to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of hollow members, post spacings, and anchorage, but not less than those required to support structural loads.

B. Assemble handrails and railing systems in the shop to the greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

C. Form changes in direction of members as follows:
   1. As detailed.
   2. By radius bends of radius indicated.
   3. Unless detailed or radius indicated, by flush radius bends.

D. Form simple and compound curves by bending pipe in jigs to produce uniform curvature for each repetitive configuration required; maintain cylindrical cross section of pipe throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of pipe.

E. Welded Connections: Fabricate handrails and railing systems for connection of members by welding. For connections made during fabrication, weld corners and seams continuously to comply with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At tee and cross intersections, cope ends of intersecting members to fit contour of pipe or tube to which end is joined, and weld all around.
   5. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and welded surface matches contours of adjoining surfaces.

F. Nonwelded Connections: Fabricate handrails and railing systems by connecting members with railing manufacturer's standard concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
   1. Fabricate splice joints for field connection using epoxy structural adhesive where this represents manufacturer's standard splicing method.

G. Brackets, Flanges, Fittings, and Anchors: Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to interconnect handrail and railing system members to other construction.

H. Provide inserts and other anchorage devices to connect handrails and railing systems to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railing systems. Coordinate anchorage devices with supporting structure.

I. For railing posts set in concrete, provide preset sleeves of steel, not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, and steel plate forming bottom closure.

J. For removable railing posts, fabricate slip-fit sockets from steel pipe whose inside diameter is sized for a close fit with posts and to limit deflection of post without lateral load, measured at top, to not more than 1/12 of post height. Provide socket covers designed and fabricated to resist accidental dislodgement.
   1. Provide wall brackets designed to accept removable railings. Railings shall be secured to brackets by set screws.

K. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

L. Ease exposed edges to a radius of approximately 1/32 inch, unless otherwise indicated. Form bent-metal corners to the smallest radius possible without causing grain separation or otherwise impairing work.

M. Cut, reinforce, drill, and tap components, as indicated, to receive finish hardware, screws, and similar items.

N. Provide weepholes, or another means to evacuate entrapped water, in hollow sections of railing members that are exposed to exterior or to moisture from condensation or other sources.

O. Fabricate joints that will be exposed to weather in a manner to exclude water.

P. Provide wall returns at ends of wall-mounted handrails, unless otherwise indicated.

Q. Fillers: Provide steel sheet or plate fillers, of thickness and size indicated or required to support structural loads of handrails, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses to produce adequate bearing to prevent bracket rotation and overstressing substrate.

2.7 FINISHES, GENERAL

A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering prior to shipment.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one half of the range of approved samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved samples and they are assembled or installed to minimize contrast.

2.8 STEEL FINISHES

A. Fill vent and drain holes that will be exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.

B. For nongalvanized steel handrails and railing systems, provide nongalvanized ferrous metal fittings, brackets, fasteners, and sleeves, except provide galvanized anchors where embedded in exterior masonry and concrete construction.

C. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface-preparation specifications and environmental exposure conditions of installed railings:
   1. Exteriors (SSPC Zone 1B): SSPC-SP 6 "Commercial Blast Cleaning."
   2. Interiors (SSPC Zone 1A): SSPC-SP 7 "Brush-Off Blast Cleaning."

D. Apply shop primer to prepared surfaces of handrails and railing components, unless otherwise indicated. Comply with requirements of SSPC-PA 1 "Paint Application Specification No. 1" for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

EXECUTION

3.1 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installing anchorages, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete as masonry construction. Coordinate delivery of such items to Project site.

3.2 INSTALLATION, GENERAL

A. Fit exposed connections accurately together to form tight, hairline joints.

B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing handrails and railing systems. Set handrails and railing systems accurately in location, alignment, and elevation, measured from established lines and levels and free from rack.
   1. Do not weld, cut, or abrade surfaces of handrails and railing components that have been coated or finished after fabrication and are intended for field connection by mechanical or other means without further cutting or fitting.
   2. Set posts plumb within a tolerance of 1/4 inch in 12 feet.
   3. Align rails so that variations from level for horizontal members and from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.

C. Field Welding: Comply with the following requirements:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and welded surface matches contours of adjoining surfaces.

D. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

E. Adjust handrails and railing systems prior to anchoring to ensure matching alignment at abutting joints. Space posts at interval indicated but not less than that required by design loadings.

F. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing handrails and railing systems and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

A. Welded Connections: Use fully welded joints for permanently connecting railing components by welding. Cope or butt components to provide 100 percent contact, or use fittings designed for this purpose.

3.4 ANCHORING POSTS

A. Anchor posts in concrete with pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, solidly fill annular space between post and sleeve with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's directions.

B. Anchor posts in concrete by forming or core-drilling holes not less than 5 inches deep and 3/4 inch greater than outside diameter of post. Clean holes of all loose material, insert posts, and fill annular space between post and concrete with the following anchoring material, mixed and placed to comply with anchoring material manufacturer's directions.
   1. Nonshrink, nonmetallic grout.

C. Cover anchorage joint with a round steel flange attached to post as follows:
   1. By set screws.

D. Install removable railing sections, if any, where indicated in slip-fit metal sockets cast into concrete. Accurately locate sockets to match post spacing. Install wall brackets as required.

3.5 ANCHORING RAIL ENDS

A. Anchor rail ends into concrete and masonry with round flanges connected to rail ends and anchored into wall construction with post-installed anchors and bolts.

B. Anchor rail ends to metal surfaces, if any, with oval or round flanges.
   1. Connect flanges to rail ends using nonwelded connections.

3.6 ATTACHING HANDRAILS TO WALLS

A. Attach handrails to wall with wall brackets and end fittings. Provide bracket with 1-1/2-inch clearance from inside face of handrail to finished wall surface.

B. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

C. Secure wall brackets and wall return fittings to building construction as follows:
   1. Use type of bracket with predrilled hole for exposed bolt anchorage.
   2. For concrete and solid masonry anchorage, use drilled-in expansion shield and either concealed hanger bolt or exposed lag bolt, as applicable.
   3. For hollow masonry anchorage, use toggle bolts with square heads.
   4. For wood stud partitions, use lag bolts set into wood backing between studs. Coordinate with stud installation to accurately locate backing members.
   5. For steel-framed gypsum board assemblies, fasten brackets directly to steel framing or concealed anchors using self-tapping screws of size and type required to support structural loads.

3.7 ADJUSTING AND CLEANING

A. Clean the following metals by washing thoroughly with clean water and soap, followed by rinsing with clean water.
   1. Aluminum.
   2. Stainless Steel.

B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material.

3.8 PROTECTION

A. Protect finishes of handrails and railing systems from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period so that no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 00 00 00

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SECTION 05 55 00 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The Work of this Section consists of the provision of all plant, labor, materials, equipment, testing and services necessary to complete the work of metal fabrications as shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following (NOT ALL USED):
   1. Steel framing and supports for countertops.
   2. Steel tube reinforcement for low partitions.
   3. Steel framing and supports for mechanical and electrical equipment.
   4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
   5. Elevator machine beams**,** hoist beams, and divider beams.
   6. Steel shapes for supporting elevator door sills.
   7. Shelf angles, galvanized at exterior wall.
   8. Metal ladders, including Elevator Pit Ladders and Roof Hatch Ladders: Steel.
      a. Exterior ladders galvanized, space side rails 18 inches apart.
      b. Elevator pit ladders – space side rails 18 inches apart.
   9. Elevator pit sump covers.
   10. Miscellaneous steel trim including steel angle corner guards steel edgings and loading-dock edge angles (exterior: galvanized).
   11. Abrasive metal nosings tread: Cast iron – at exterior stairs, cast-in-place.
   12. Loose bearing and leveling plates, galvanized, for applications where they are not specified in other Sections.
   13. Loose steel lintels, galvanized at exterior wall, Steel weld plates and angles not specified in other Sections, for casting into concrete.

B. Products furnished, but not installed, under this Section include the following:

   1. Loose steel lintels.
   2. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
   3. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.

C. Related Requirements:

   1. Division 03 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
   2. Division 04 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.

3. Division 05 "Structural Steel Framing," "Metal Stairs" for cast and extruded treads and nosings, "Pipe and Tube Railings," "Decorative Metal," "Decorative Metal Railings."

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

C. Samples for Verification: For each type and finish of extruded nosing and tread.

D. Delegated-Design Submittal: For ladders, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer.

B. Mill Certificates: Signed by stainless-steel manufacturers, certifying that products furnished comply with requirements.

C. Welding certificates.

D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

E. Research/Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

B. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.
   1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
   2. Provide allowance for trimming and fitting at site.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design ladders.

B. Structural Performance of Aluminum Ladders: Aluminum ladders, including landings, shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

   1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.2 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304 and Type 316L (exterior).

D. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304, Type 316L (exterior).

E. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

F. Rolled-Stainless-Steel Floor Plate: ASTM A 793.

G. Abrasive-Surface Floor Plate: Steel plate with abrasive granules rolled into surface or with abrasive material metallically bonded to steel.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. IKG Industries, a division of Harsco Corporation; Mebac.
b. SlipNOT Metal Safety Flooring, a W. S. Molnar company; SlipNOT.

H. Steel Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

I. Steel Pipe: ASTM A 53/A 53M, Standard Weight (Schedule 40) unless otherwise indicated.

J. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.

1. Size of Channels: 1-5/8 by 1-5/8 inches (41 by 41 mm) or as indicated.
2. Material: Galvanized steel, ASTM A 653/A 653M, commercial steel, Type B and structural steel, Grade 33 (Grade 230), with G90 (Z275) coating; 0.064-inch (1.6-mm) nominal thickness.
3. Material: Cold-rolled steel, ASTM A 1008/A 1008M, commercial steel, Type B and structural steel, Grade 33 (Grade 230); 0.0528-inch (1.35-mm) minimum thickness; hot-dip galvanized after fabrication.

K. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

L. Aluminum Plate and Sheet: ASTM B 209 (ASTM B 209M), Alloy 6061-T6.

M. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.

N. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

O. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.

2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 (interior) Type 316 (exterior) stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

1. Provide stainless-steel fasteners for fastening aluminum.
2. Provide stainless-steel fasteners for fastening stainless steel.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3 (ASTM A 325M, Type 3); with hex nuts, ASTM A 563, Grade C3 (ASTM A 563M, Class 8S3); and, where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593 (ASTM F 738M); with hex nuts, ASTM F 594 (ASTM F 836M); and, where indicated, flat washers; Alloy Group 1 (A1) and Group 2 (A4).

E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563 (ASTM A 563M); and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

G. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.

H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) and Group 2 (A4) stainless-steel bolts, ASTM F 593 (ASTM F 738M), and nuts, ASTM F 594 (ASTM F 836M).

I. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches (41 by 22 mm) by length indicated with anchor straps or studs not less than 3 inches (75 mm) long at not more than 8 inches (200 mm) o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Shop Primers: Provide primers that comply with Division 09 "Painting." `

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

C. Water-Based Primer: Emulsion type, anticorrosive primer for mildly corrosive environments that is resistant to flash rusting when applied to cleaned steel, complying with MPI#107 and compatible with topcoat.

D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

E. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.

F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

I. Concrete: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa).

2.5 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

J. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 6-inch (150-mm) embedment and 2-inch (50-mm) hook, not less than 8 inches (200 mm) from ends and corners of units and 24 inches (600 mm) o.c., unless otherwise indicated.

2.6 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.

1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.

C. Fabricate supports for operable partitions from continuous steel beams of sizes indicated with attached bearing plates, anchors, and braces as indicated. Drill or punch bottom flanges of beams to receive partition track hanger rods; locate holes where indicated on operable partition Shop Drawings.

D. Galvanize miscellaneous framing and supports where indicated.

E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.7 SHELF ANGLES

A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch (19-mm) bolts, spaced not more than 6 inches (150 mm) from ends and 24 inches (600 mm) o.c., unless otherwise indicated.

1. Provide mitered and welded units at corners.
2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches (50 mm) larger than expansion or control joint.

B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.

C. Galvanize and prime shelf angles located in exterior walls.

D. Prime shelf angles located in exterior walls with zinc-rich primer.

E. Furnish wedge-type concrete inserts, complete with fasteners, to attach shelf angles to cast-in-place concrete.

2.8 METAL LADDERS

A. General:

1. Comply with ANSI A14.3**,** except for elevator pit ladders.
2. For elevator pit ladders, comply with ASME A17.1/CSA B44.

B. Steel Ladders:

1. Space siderails 18 inches (457 mm)] apart unless otherwise indicated.
2. Siderails: Continuous, 3/8-by-2-1/2-inch (9.5-by-64-mm) steel flat bars, with eased edges.
3. Rungs: 3/4-inch- (19-mm-) square steel bars.
4. Fit rungs in centerline of siderails; plug-weld and grind smooth on outer rail faces.
5. Provide nonslip surfaces on top of each rung, either by coating rung with aluminum-oxide granules set in epoxy-resin adhesive or by using a type of manufactured rung filled with aluminum-oxide grout.
6. Provide nonslip surfaces on top of each rung by coating with abrasive material metallically bonded to rung.

    a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

        1) Harsco Industrial IKG, a division of Harsco Corporation; Mebac.
        2) SlipNOT Metal Safety Flooring, a division of W. S. Molnar Company; SlipNOT.

7. Provide platforms as indicated fabricated from welded or pressure-locked steel bar grating, supported by steel angles. Limit openings in gratings to no more than 1/2 inch (12 mm) in least dimension.
8. Support each ladder at top and bottom and not more than 60 inches (1500 mm) o.c. with welded or bolted steel brackets.
9. Galvanize and prime exterior ladders, including brackets.
10. Prime exterior ladders, including brackets and fasteners, with zinc-rich primer.

2.9 ELEVATOR PIT SUMP COVERS

A. Fabricate from welded or pressure-locked steel bar grating Limit openings in gratings to no more than 1 inch (25 mm)] in least dimension.

B. Provide steel angle supports as indicated.

2.10 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize and prime exterior miscellaneous steel trim.

D. Prime exterior miscellaneous steel trim with zinc-rich primer.

2.11 ABRASIVE METAL NOSINGS

A. Cast-Metal Units: Cast iron with an integral-abrasive, as-cast finish consisting of aluminum oxide, silicon carbide, or a combination of both. Fabricate units in lengths necessary to accurately fit openings or conditions.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Safety Tread Co., Inc.
b. Balco, Inc.
c. Barry Pattern & Foundry Co., Inc.
d. Granite State Casting Co.
e. Safe-T-Metal Company, Inc.
f. Wooster Products Inc.

2. Nosings: Cross-hatched units, 1-1/2 by 1-1/2 inches (38 by 38 mm), for casting into concrete.

B. Provide anchors for embedding units in concrete, either integral or applied to units, as standard with manufacturer.

C. Drill for mechanical anchors and countersink. Locate holes not more than 4 inches (100 mm) from ends and not more than 12 inches (300 mm) o.c., evenly spaced between ends, unless otherwise indicated. Provide closer spacing if recommended by manufacturer.

1. Provide two rows of holes for units more than 5 inches (125 mm) wide, with two holes aligned at ends and intermediate holes staggered.

D. Apply bituminous paint to concealed surfaces of cast-metal units.

2.12 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates.

C. Prime plates with zinc-rich primer.

2.13 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.

B. Galvanize and prime loose steel lintels located in exterior walls.

C. Prime loose steel lintels located in exterior walls with zinc-rich primer.

D. Shop paint galvanized lintels.

2.14 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.15 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.16 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.

C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.

1. Shop prime with universal shop primer unless zinc-rich primer is indicated.

D. Preparation for Shop Priming: Prepare surfaces to comply with requirements indicated below:

1. Exterior Items: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
3. Items Indicated to Receive Primers Specified in Section 099600 "High-Performance Coatings": SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
4. Other Items: SSPC-SP 3, "Power Tool Cleaning."

E. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

2.17 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

B. Clear Anodic Finish: AAMA 611, Class I, AA-M12C22A41.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for

use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that come into contact with grout, concrete, masonry, wood, or dissimilar metals with the following:

1. Cast Aluminum: Heavy coat of bituminous paint.
2. Extruded Aluminum: Two coats of clear lacquer.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

B. Anchor supports for operable partitions and overhead grilles securely to, and rigidly brace from, building structure.

C. Support steel girders on solid grouted masonry, concrete, or steel pipe columns. Secure girders with anchor bolts embedded in grouted masonry or concrete or with bolts through top plates of pipe columns.

1. Where grout space under bearing plates is indicated for girders supported on concrete or masonry, install as specified in "Installing Bearing and Leveling Plates" Article.

D. Install pipe columns on concrete footings with grouted baseplates. Position and grout column baseplates as specified in "Installing Bearing and Leveling Plates" Article.

1. Grout baseplates of columns supporting steel girders after girders are installed and leveled.

3.3 INSTALLING NOSINGS

A. Center nosings on tread widths unless otherwise indicated.

B. For nosings embedded in concrete steps or curbs, align nosings flush with riser faces and level with tread surfaces.

C. Seal thresholds exposed to exterior with elastomeric sealant complying with Section 079200 "Joint Sealants" to provide a watertight installation.

3.4 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 INSTALLING METAL STAIRS WITH GROUTED BASEPLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of baseplates.

B. Set steel stair baseplates on wedges, shims, or leveling nuts. After stairs have been positioned and aligned, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
   1. Use nonmetallic, nonshrink grout, unless otherwise indicated.
   2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.6 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

   1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 09.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

3.7 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

   1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
   2. Set aside and protect materials suitable for reuse and/or remanufacturing.
   3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 05 50 00

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SECTION 05 58 13 - COLUMN COVERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes snap-together metal column covers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, including finishing materials.

B. Shop Drawings: Show fabrication and installation details for column covers.

C. Samples for Initial Selection: For products involving selection of color, texture, or design [, including mechanical finishes].

D. Samples for Verification: For each type of exposed finish required, prepared on 6-inch- square Samples of metal of same thickness and material indicated for the Work.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data.

1.6 QUALITY ASSURANCE

A. Fabricator Qualifications: A firm experienced in producing column covers similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver column covers wrapped in protective coverings and strapped together in suitable packs or in heavy-duty cartons. Remove protective coverings before they stain or bond to finished surfaces.

PART 2 - PRODUCTS

2.1 SNAP-TOGETHER COLUMN COVERS

A. List of manufacturer:

1. SAF
2. Gordon
3. Pac-Clad

B. Form column covers to shapes indicated from metal of type and minimum thickness indicated below. Return vertical edges and bend to form hook that engages continuous mounting clips.

1. Aluminum Sheet: ASTM B 209, with not less than strength and durability properties of Alloy 5005-H32, 0.063 inch thick.
   a. Finish: Baked enamel or powder coat.
2. Column covers may be fabricated from prefinished metal sheet in lieu of finishing after fabrication provided unfinished edges are concealed from view.
3. Increase metal thickness or reinforce with concealed stiffeners, backing materials, or both, as needed to provide flat surfaces where indicated.
4. Support joints with concealed stiffeners as needed to hold exposed faces of adjoining sheets in flush alignment.
5. Fabricate column covers with flush vertical joints.
6. Fabricate column covers without horizontal joints, unless recommended by manufacturer.
7. Fabricate base ring to match column covers.
8. Apply manufacturer's recommended sound-deadening insulation to backs of column covers.

2.2 MISCELLANEOUS MATERIALS

A. Fasteners: Fabricated from same basic metal and alloy as fastened metal unless otherwise indicated. Do not use metals that are incompatible with materials joined.

1. Provide concealed fasteners for interconnecting column covers and for attaching them to other work unless otherwise indicated.

B. Backing Materials: Provided or recommended by column cover manufacturer.

2.3 FABRICATION, GENERAL

A. Coordinate dimensions and attachment methods of column covers with those of adjoining construction to produce integrated assemblies with closely fitting joints and with edges and surfaces aligned unless otherwise indicated.

B. Form metal to profiles indicated, in maximum lengths to minimize joints. Produce flat, flush surfaces without cracking or grain separation at bends.

2.4 GENERAL FINISH REQUIREMENTS

A. Complete mechanical finishes of flat sheet metal surfaces before fabrication where possible. After fabrication, finish all joints, bends, abrasions, and other surface blemishes to match sheet finish.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Apply organic and anodic finishes to formed metal after fabrication unless otherwise indicated.

D. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of column covers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Locate and place column covers plumb and in alignment with adjacent construction. Perform cutting, drilling, and fitting required to install column covers.

1. Do not cut or abrade finishes that cannot be completely restored in the field. Return items with such finishes to the shop for required alterations, followed by complete refinishing, or provide new units as required.

B. Use concealed anchorages where possible.

C. Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers as indicated.

D. Corrosion Protection: Apply bituminous paint or other permanent separation materials on concealed surfaces where metals would otherwise be in direct contact with substrate materials that are incompatible or could result in corrosion or deterioration of either material or finish.

3.3 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean abraded areas of shop paint and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

   1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit or provide new units.

3.4 PROTECTION

A. Protect finishes from damage during construction period. Remove temporary protective coverings at time of Substantial Completion.

END OF SECTION 05 58 13

SECTION 05 73 00 – DECORATIVE METAL RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 General Requirements, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Stainless Steel decorative metal cable railing system
2. Fasteners.
3. Miscellaneous materials.

B. Related Requirements:

1. Section 055213 "Pipe and Tube Railings" for nonornamental railings fabricated from pipes and tubes.
2. Section 057313 "Glazed Decorative Metal Railings" for structural glass-supported decorative metal railings and post-supported railings with glass-infill panels.

1.3 DEFINITIONS

A. Railings: Guards, handrails, and similar devices used for protection of occupants at open-sided floor areas and for pedestrian guidance and support, visual separation, or wall protection.

1.4 COORDINATION AND SCHEDULING

A. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver items to Project site in time for installation.

B. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not meet structural performance requirements.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Manufacturer's product lines for **CIRCA Railing System Cable Infill**, stainless steel decorative metal railings assembled from standard components.
2. **<u>Stainless steel cable</u> and cable fittings infill.**
3. Fasteners.
4. Post-installed anchors.
5. Handrail brackets.
6. Bituminous paint.
7. Nonshrink, nonmetallic grout.
8. Anchoring cement.
9. Metal finishes.

B. Sustainable Design Submittals:."

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Chain-of-Custody Certificates: For certified wood products. Include statement of costs.

C. Shop Drawings: Include plans, elevations, sections, and attachment details.

D. Samples for Initial Selection: For products involving selection of color, texture, or design.

E. Samples for Verification: For each type of exposed finish required.

1. Sections of each distinctly different linear railing member, including handrails, top rails, posts, and balusters
2. Fittings, end caps, and brackets.
3. Cable and cable hardware and connections.
4. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and guard infill. Sample need not be full height.

    a. Show method of **connecting and finishing** members at intersections.

F. Delegated Design Calculations: For railings, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For **delegated design professional engineer testing agency**] [**manufacturer-certified Installer**.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: The manufacturer of railing system or a qualified installation firm that is approved, authorized, or licensed by railing system manufacturer to install manufacturer's products.

B. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

1. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."
2. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.8 MOCKUPS

A. Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Build mockups full-height assembly indicated on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with railings by field measurements before fabrication and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain decorative metal railing systems from single source from single manufacturer. Systems must be designed, engineered, and fabricated by manufacturer of railing system.

2.2 MANUFACTURERS

A. Powder coated Stainless Steel Decorative Metal Cable Infill Railings:

1. Basis-of-Design Product: Subject to compliance with requirements, provide VIVA Railings, LLC; CIRCA Railing System or comparable product by one of the following:

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of railings and are based on the specific system indicated. See Section 016000 "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

2.3 PERFORMANCE REQUIREMENTS

A. General: For engineering decorative metal railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:

1. Stainless Steel: 45 percent of minimum yield strength.
2. Steel: 72 percent of minimum yield strength.

B. Structural Performance: Decorative metal railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

a. Uniform load of 50 lbf/ft. (0.73 kN/m) applied in any direction.
b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
b. Infill load and other loads need not be assumed to act concurrently.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior railings by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

2.4 METALS, GENERAL

A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

B. Brackets, Flanges, and Anchors: Same metal and finish as supported rails unless otherwise indicated.

1. Provide stainless steel wall brackets with flange tapped for concealed anchorage with vertical and horizontal adjustment capability.

2.5 STAINLESS STEEL DECORATIVE METAL RAILINGS

A. Recycled Content of Stainless Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 65 percent.

B. Stainless Steel Tubing: ASTM A554, Grade MT 316.

C. Stainless Steel Pipe: ASTM A312/A312M, Grade TP 316.

D. Stainless Steel Castings: ASTM A743/A743M, CF 20

E. Stainless Steel Sheet, Strip, Plate, and Flat Bar: ASTM A666 Type 316.

F. Stainless Steel Bars and Shapes: ASTM A276, Type 316.

G. Steel Bars: Hot-rolled, carbon steel complying with ASTM A29/A29M, Grade 1010.

H. Posts: Tube, made from powder coated stainless steel

1. Post top caps to be fully-welded to posts and ground smooth, leaving no seam marks.

I. Top Rail/Hand Rail: Tubular stainless steel pipe with round cross-section shape.

1. Cable: 1-by-19 wire cable made from wire complying with ASTM A492, Type 316.
2. Cable Diameter: 3/16 inch (5 mm).
3. Cable Fittings: Swageless hardware fabricated from stainless steel, with capability to sustain, without failure, a load equal to minimum breaking strength of cable with which they are used.

4. Provide VIVA Railings, LLC

J. Fastener Materials: Unless otherwise indicated, provide the following:

1. For [**Stainless Steel**]] Railing Components: Type 316 stainless steel fasteners.
2. For Dissimilar Metal Railing Components: Type 316 stainless steel fasteners.
3. Finish exposed fasteners to match appearance, including color and texture, of railings.

K. Fasteners for Anchoring to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction and capable of withstanding design loads.

L. Provide concealed fasteners for interconnecting railing components and for attaching railings to other work unless otherwise indicated

1. Provide hex, hex socket, or hex-button head machine screws for exposed fasteners unless otherwise indicated.

M. Post-Installed Anchors: Fastener systems with working capacity greater than or equal to the design load, in accordance with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC308.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941/F1941M, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 2 **(A4)**] stainless steel bolts, ASTM F593 and nuts, ASTM F594.

2.6 MISCELLANEOUS MATERIALS

A. Handrail Brackets: Stainless steel with center of handrail [**2-1/2 inches (63.5 mm)**] [**3-1/8 inches (79.4 mm)**] from face wall.

1. with flange tapped for concealed anchorage to threaded hanger bolt.
2. Provide brackets with predrilled hole for exposed bolt anchorage.
3. Provide brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.

B. Welding Rods and Bare Electrodes: Select in accordance with AWS specifications for metal alloy welded.

1. Provide type and alloy as recommended by producer of metal to be welded and as required for color match, strength, and compatibility in fabricated items.

C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.

D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107/C1107M. Provide grout specifically recommended by manufacturer for exterior applications.

E. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

1. Water-Resistant Product: At exterior locations provide formulation that is recommended in writing to be resistant to erosion from water exposure without needing protection by a sealer or waterproof coating.

2.7 FABRICATION

A. General: Fabricate decorative metal railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.

B. Shop assemble railings and guards to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations.

1. Clearly mark units for reassembly and coordinated installation.
2. Use connections that maintain structural value of joined pieces.

C. Cut, drill, and punch metals cleanly and accurately.

1. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated.
2. Remove sharp or rough areas on exposed surfaces.

D. Form work true to line and level with accurate angles and surfaces.

E. Fabricate connections that will be exposed to weather in a manner to exclude water.

1. Provide weep holes where water may accumulate.
2. Locate weep holes in inconspicuous locations.

F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.

G. Connections: Fabricate railings with welded

H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove flux immediately.
4. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Finish #1 welds; ornamental quality with no evidence of a welded joint.

I. Mechanical Connections: Connect members with concealed mechanical fasteners and fittings.

1. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.
2. Fabricate splice joints for field connection using an epoxy structural adhesive if this is manufacturer's standard splicing method.

J. Form changes in direction as follows
1. By bending
2. By flush bends
3. By radius bends of radius indicated
4. By bending to smallest radius that will not result in distortion of railing member.

K. Bend members in jigs to produce uniform curvature for each configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.

L. Close exposed ends of hollow railing members with prefabricated cap and end fittings of same metal and finish as railings.

M. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns, unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.

N. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, handrail brackets, miscellaneous fittings, and anchors to interconnect railing members to other Work unless otherwise indicated.

1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers or other means to transfer loads through wall finishes to structural supports and to prevent bracket or fitting rotation and crushing of substrate.

O. Provide inserts and other anchorage devices for connecting railings to concrete or masonry Work.

1. Fabricate anchorage devices capable of withstanding loads imposed by railings.
2. Coordinate anchorage devices with supporting structure.

P. For railing posts set in concrete, provide stainless steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.

Q. For removable railing posts, fabricate slip-fit sockets from stainless steel tube or pipe whose ID is sized for a close fit with posts; limit movement of post without lateral load, measured at top, to not more than one-fortieth of post height.

1. Provide socket covers designed and fabricated to resist being dislodged.
2. Provide chain with eye, snap hook, and staple across gaps formed by removable railing sections at locations indicated. Fabricate from same metal as railings.

R. Stainless Steel Cable Guard Infill: Fabricate cable guard infill assemblies in the shop to field-measured dimensions with fittings machine swaged.

1. Minimize amount of turnbuckle take-up used for dimensional adjustment, so maximum amount is available for tensioning cable.
2. Tag cable assemblies and fittings to identify installation locations and orientations for coordinated installation.

S. toe boards at railings around openings and at edge of open-sided floors and platforms. Fabricate to dimensions and details indicated.

2.8 METAL FINISH REQUIREMENTS, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipment.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.9 STAINLESS STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Stainless Steel Finishes:

1. Color Electro-Plated Metal: Vertical and stand-off components.

2. Dull Satin Finish: ASTM A480/A480M, No. 6.

C. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.10 STEEL FINISHES

A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

B. Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: PC 35 Dark Bronze, powder coated for outdoor use.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

B. Installation Tolerances: Structural steel and concrete slabs to be within 1/8 inch (3 mm) in 10 ft. (3.048 m) horizontally and 1/8 inch (3 mm) vertically. Correct out-of-tolerance conditions to meet railing manufacturer's requirements.

3.2 INSTALLATION, GENERAL

A. Perform cutting, drilling, and fitting required for installing railings.

1. Fit exposed connections together to form tight, hairline joints.
2. Install railings level, plumb, square, true to line; without distortion, warp, or rack.
3. Set railings accurately in location, alignment, and elevation; measured from established lines and levels.

4. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
5. Set posts plumb within a tolerance of 1/16 inch in 3 ft. (2 mm in 1 m).
6. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 ft. (6 mm in 3 m).

B. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

C. Adjust railings before anchoring to ensure matching alignment at abutting joints.

D. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 METAL RAILING CONNECTIONS

A. Nonwelded Connections: Use mechanical or adhesive joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings. Seal recessed holes of exposed locking screws, using plastic cement filler colored to match finish of railings.

B. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article, whether welding is performed in the shop or in the field.

C. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve, extending 2 inches (50 mm) beyond joint on either side; fasten internal sleeve securely to one side; and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING METAL POSTS

A. Use stainless steel pipe sleeves preset and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with [**nonshrink, nonmetallic grout**] [**or**] [**anchoring cement**], mixed and placed to comply with anchoring material manufacturer's written instructions.

B. Form or core-drill holes in accordance with engineering requirements for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with [**nonshrink, nonmetallic grout**] [**or**] [**anchoring cement**], mixed and placed to comply with anchoring material manufacturer's written instructions.

C. Cover anchorage joint with flange of same metal as post, [**welded to post after placing anchoring material**] [**attached to post with setscrews**].

D. Leave anchorage joint exposed with [**1/8-inch (3-mm) buildup, sloped away from post**] [**anchoring material flush with adjacent surface**].

E. Anchor posts to metal surfaces with flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For [**stainless steel**] [**steel**] railings, weld flanges to posts and bolt to metal-supporting surfaces.

F. Install removable railing sections, where indicated, in slip-fit metal sockets cast in concrete.

3.5 ATTACHING RAILINGS

A. Anchor railing ends to concrete and masonry with [**sleeves concealed within**] [**flanges connected to**] [**brackets on underside of rails connected to**] railing ends and anchored to wall construction with anchors and bolts.

B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and [**welded to railing ends**] [**or**] [**connected to railing ends, using nonwelded connections**].

C. Attach handrails to walls with wall brackets[**, except where end flanges are used**]. Provide brackets with [**1-1/2-inch (38-mm)**] <**Insert dimension**> clearance from inside face of handrail and finished wall surface.

1. Use type of bracket with [**flange tapped for concealed anchorage to threaded hanger bolt**] [**predrilled hole for exposed bolt anchorage**].
2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.

D. Secure wall brackets[**and railing end flanges**] to building construction as follows:

1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
2. For hollow masonry anchorage, use toggle bolts.
3. For wood stud partitions, use hanger or lag bolts set into studs or wood backing between studs. Coordinate with carpentry work to locate backing members.
4. For steel-framed partitions, use hanger or lag bolts set into[**fire-retardant-treated**] wood backing between studs. Coordinate with stud installation to locate backing members.
5. For steel-framed partitions, fasten brackets directly to steel framing or concealed steel reinforcements using self-tapping screws of size and type required to support structural loads.
6. For steel-framed partitions, fasten brackets with toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and to prepare test reports. Payment for these services will be made [**by Owner**] [**from the testing and inspecting allowance, as authorized by Change Orders**].

B. Extent and Testing Methodology: Testing agency will randomly select completed railing assemblies for testing that are representative of different railing designs and conditions in the completed Work. Test railings in accordance with ASTM E894 and ASTM E935 for compliance with performance requirements.

C. Remove and replace railings where test results indicate that they do not comply with specified requirements unless they can be repaired in a manner satisfactory to Architect and comply with specified requirements.

D. Perform additional testing and inspecting, at Contractor's expense, to determine compliance of replaced or additional work with specified requirements.

3.7 CLEANING

A. Clean [**stainless steel**] [**and**] [**steel**] by washing thoroughly with clean water and soap, rinsing with clean water, and wiping dry.

B. Clean wood rails by wiping with a damp cloth and then wiping dry.

3.8 PROTECTION

A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

B. Restore finishes damaged during installation and construction period, so no evidence remains of correction work. Return items that cannot be refinished in the field to the shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION 057300

SECTION 06 10 00 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section consists of the provision of all plant, labor, materials, equipment, testing and services necessary to complete the work of rough carpentry as shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Wood Preservative Treated Lumber.
2. Fire Retardant Treated Lumber.
3. Misc. Lumber.
4. Plywood backing panels.
5. Un-Treated roof related solid blocking, beveled siding, and plywood.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements.
3. Data for each type of fastener and anchor.

B. Mockups:

1. Construct 4 foot long mockups of each roof blocking assembly, to show how it will fit, get fastened to, and relate to adjoining building components.

2. Obtain the Architect's approval of each mock up before proceeding with the work. Remove and replace mockups that are rejected; approved mockups may be left in place and incorporated into the finished project.

1.3 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated wood.
3. Powder-actuated fasteners.
4. Expansion anchors.
5. Metal framing anchors.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship".

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Provide dressed lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 15 percent for 2-inch nominal thickness or less, 19 percent for more than 2-inch nominal thickness unless otherwise indicated.

D. Roof blocking:
1. Construction grade Douglas Fir, kiln dried to 15%
2. Utility grade beveled cedar or redwood siding, or equivalent synthetic lumber products.
3. APA rated CDX plywood panels, assembled with exterior glue.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat all rough carpentry unless otherwise indicated.

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
5. Do not treat roof related blocking or plywood.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.

2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.

C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

E. Application: Treat all rough carpentry items indicated on Drawings, and the following:

1. Concealed blocking.
2. Plywood backing panels.

F. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, which meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Rooftop equipment bases and support curbs.
4. Cants.
5. Furring.
6. Grounds

B. Provide miscellaneous lumber for support or attachment of other construction in the following locations **(whether indicated on the plans or not):**

1. All wall mounted counters, shelf millwork units of any kind, and items furnished by the owner requiring wood blocking.
2. Any recessed items requiring wood blocking for attachment and or leveling.
3. Any and all construction elements requiring anchoring to walls and or structure.

C. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.

D. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine; No. 2 grade; SPIB.
2. Eastern softwoods; No. 2 Common grade; NeLMA.
3. Northern species; No. 2 Common grade; NLGA

2.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Power-Driven Fasteners: NES NER-272.

C. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

D. Fasteners for roof related blocking shall be hot dipped galvanized steel; or steel with a proprietary rust inhibiting coating. Utilize minimum #12 diameter screws where ever possible; nails if used, shall have annular ring shanks. Do not use “dry-wall” screws to assemble roof related wood blocking. Anchors bolts shall have be formed of 1/2 inch diameter steel. Drilled anchors shall have 1/4 inch diameter shanks.

2.7 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cleveland Steel Specialty Co.
2. KC Metals Products, Inc.
3. Phoenix Metal products, Inc.
4. Simpson Strong-Tie Co., Inc.
5. USP Structural Connectors.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

D. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

2.8 MISCELLANEOUS MATERIALS

A. Sill-Sealer Gaskets: Glass-fiber-resilient insulation, fabricated in strip form, for use as a sill sealer; 1-inch nominal thickness, compressible to 1/32 inch; selected from manufacturer's standard widths to suit width of sill members indicated.

B. Sill-Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to suit width of sill members indicated.

C. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber or rubberized-asphalt compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

D. Adhesives for Gluing Furring and Sleepers to Concrete or Masonry: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.

1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

D. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

E. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

F. Do not splice structural members between supports unless otherwise indicated.

G. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.

2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

J. Roof Blocking:

1. Stagger joints in built up assemblies at least 2 feet to obtain maximum strength. Provide the appropriate shapes needed and adjust wood members to suit existing conditions for full bearing and secure attachment. Discard defective material, and pieces which are too small, and fabricate the work with a minimum of joints and an optimum joint arrangement.

2. Securely attach roof blocking to resist a pull of 275 pounds per lineal foot in any direction. Countersink all fasteners flush.

3. Space fasteners to achieve adequate holding power, generally as follows:
   a. Anchor bolts embedded in concrete, anchors drilled into concrete or masonry, screws into a steel deck or structural steel member, or screws into wood framing: 12 inches on center.
   b. Nails into wood: 8 inches on center.
   c. Install two rows of fasteners on blocking wider than 5 inches.
4. Install blocking neatly scribed and cut to fit within 1/4 inch of adjoining materials. Install blocking, shims and similar supports for the proper attachment of subsequent work.

3.2 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

C. Do not allow roof blocking to get wet while stored or during installation; remove and replace any roof related blocking that gets wet.

3.3 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.
   1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
   2. Set aside and protect materials suitable for reuse and/or remanufacturing.
   3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 06 10 00

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SECTION 06 16 00 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The Work of this Section consists of the provision of all plant, labor, materials, equipment, testing and services necessary to complete the work of sheathing as shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Wall sheathing.
2. Roof sheathing.
3. Fasteners.
4. Sheathing joint and penetration treatment.

B. Related Requirements:

1. Division 06 "Rough Carpentry".
2. Division 07 “Thermal and Moisture Protection”
3. Division 07 “TPO Roofing”

C. **FOR ROOF SHEATHING, REFER TO SPECIFICATION SECTION 07 54 23**.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements. Include physical properties of treated materials.
3. For fire-retardant treatments, include physical properties of treated plywood both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5516.
4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For following products, from ICC-ES:

1. Preservative-treated plywood.
2. Fire-retardant-treated plywood.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory."

2.2 WOOD PANEL PRODUCTS

A. Certified Wood: For the following wood products, provide materials produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":

1. Plywood.
2. Particleboard underlayment.
3. Hardboard underlayment.

B. Plywood: Either DOC PS 1 or DOC PS 2 unless otherwise indicated.

C. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.

D. Factory mark panels to indicate compliance with applicable standard.

2.3 PRESERVATIVE-TREATED PLYWOOD

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

B. Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

1. Use treatment that does not promote corrosion of metal fasteners.
2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D 2898. Use for exterior locations and where indicated.
3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
4. Design Value Adjustment Factors: Treated lumber plywood shall be tested according ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified. For roof sheathing and where high-temperature fire-retardant treatment is indicated, span ratings for temperatures up to 170 deg F (76 deg C) shall be not less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat plywood indicated on Drawings, and the following:

1. Roof and wall sheathing within 48 inches (1220 mm) of fire walls.
2. Roof sheathing.
   a. Refer to Specification Section 07 53 23 for Gypsum Roof Sheathing. Plywood sheathing may be considered by Architect's Roofing Consultant. Acceptance will depend on condition.

2.5 WALL SHEATHING

A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.

1. Products: Subject to compliance with requirements, provide the following:

   a. CertainTeed Corporation; GlasRoc.
   b. G-P Gypsum Corporation; Dens-Glass Gold.
   c. National Gypsum Company; Gold Bond e(2)XP.
   d. Temple-Inland Inc.; GreenGlass
   e. United States Gypsum Co.; Securock.

2. Type and Thickness: Type X, 5/8 inch (15.9 mm) thick.
3. Size: 48 by 96 inches (1219 by 2438 mm) for vertical installation.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. For roof and wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For wall and roof sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.

1. For steel framing less than 0.0329 inch (0.835 mm) thick, use screws that comply with ASTM C 1002.

2. For steel framing from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick, use screws that comply with ASTM C 954.

2.7 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

A. Sealant for Glass-Mat Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 079200 "Joint Sealants."

2.8 MISCELLANEOUS MATERIALS

A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 or ASTM D 3498 that is approved for use with type of construction panel indicated by manufacturers of both adhesives and panels.

1. Adhesives shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.
2. Install boards with a 3/8-inch (9.5-mm) gap where non-load-bearing construction abuts structural elements.
3. Install boards with a 1/4-inch (6.4-mm) gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.

D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8 inches (200 mm) o.c. and set back a minimum of 3/8 inch (9.5 mm) from edges and ends of boards.

E. Seal sheathing joints according to sheathing manufacturer's written instructions.

1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

3.3 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.
1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 06 16 00

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SECTION 06 20 23 - INTERIOR FINISH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The Work of this Section consists of the provision of all plant, labor, materials, equipment, testing and services necessary to complete the work of finish carpentry as shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Interior trim
2. Interior plywood and hardboard paneling.

B. Related Requirements:

1. Division 06 "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view.
2. Division 09 "Interior Painting" for priming and back-priming of interior finish carpentry.

1.3 DEFINITIONS

A. MDF: Medium-density fiberboard.

B. MDO: Plywood with a medium-density overlay on the face.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.

1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
2. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.
3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced before shipment to Project site to levels specified.

4. Include copies of warranties from chemical-treatment manufacturers for each type of treatment.

B. Samples for Initial Selection: For each type of product involving selection of colors, profiles, or textures.

C. Samples for Verification:

1. For each species and cut of lumber and panel products with non-factory-applied finish, with 1/2 of exposed surface finished, 50 sq. in. (300 sq. cm) for lumber and 8 by 10 inches (200 by 250 mm) for panels.

1.5 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For fire-retardant-treated wood, from ICC-ES.

B. Sample Warranty: For manufacturer's warranty.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

B. Deliver interior finish carpentry materials only when environmental conditions meet requirements specified for installation areas. If interior finish carpentry materials must be stored in other than installation areas, store only where environmental conditions meet requirements specified for installation areas.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install interior finish carpentry materials until building is enclosed and weatherproof, wet work in space is completed and nominally dry, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Materials: The following wood products shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.

1. Interior trim.
2. Interior plywood and hardboard paneling.
3. Shelving and clothes rods.

B. Certified Wood: The following wood products shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship":

1. Interior trim.
2. Interior plywood and hardboard paneling.
3. Shelving and clothes rods.

C. Lumber: DOC PS 20 and the following grading rules:

1. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."
2. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."

D. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

E. Hardboard: AHA A135.4.

F. MDF: ANSI A208.2, Grade 130 made with binder containing no urea-formaldehyde resin.

G. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea-formaldehyde resin.

H. Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

1. Color: As selected by Architect from manufacturer's full range.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.

1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent respectively.
2. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
3. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
4. Do not use material that is warped or does not comply with requirements for untreated material.
5. Mark lumber with treatment-quality mark of an inspection agency approved by the American Lumber Standard Committee's Board of Review.

    a. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

6. Application: Where indicated.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: For applications indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction, and comply with testing requirements; testing by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet (3.2 m) beyond the centerline of the burners at any time during the test.

    1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent respectively.

C. For exposed items indicated to receive a stained or natural finish, use organic resin chemical formulations that do not contain colorants, and provide materials that do not have marks from spacer sticks on exposed face.

D. Do not use material that does not comply with requirements for untreated material or is warped or discolored.

E. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

    1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.
    2. For exposed plywood indicated to receive a stained or natural finish, mark back of each piece.

F. Application: Where indicated.

2.4 INTERIOR TRIM

A. Softwood Lumber Trim for Transparent Finish (Stain or Clear Finish):

1. Species and Grade: Eastern white pine, C Select; NeLMA or NLGA.
2. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
3. Finger Jointing: Not allowed.
4. Face Surface: Surfaced (smooth).

B. Hardwood Lumber Trim for Transparent Finish (Stain or Clear Finish)

1. Species and Grade: Birch; NHLA Clear.

2. Maximum Moisture Content: 9 percent.

3. Finger Jointing: Not allowed.

4. Gluing for Width: Allowed.

5. Veneered Material: Allowed.

6. Face Surface: Surfaced (smooth).

7. Matching: Selected for compatible grain and color.

C. Lumber Trim for Opaque Finish (Painted Finish):

1. Species and Grade: Eastern white pine, C Select; NeLMA or NLGA.
2. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
3. Finger Jointing: Not allowed.

4. Face Surface: Surfaced (smooth).

D. Softwood Moldings for Opaque Finish (Painted Finish): Made to patterns included in WMMPA WM 12.

1. Softwood Moldings: WMMPA WM 4, P grade.

   a. Species: Eastern white, Idaho white, lodgepole, ponderosa, radiata, or sugar pine.
   b. Maximum Moisture Content: 15 percent with at least 85 percent of shipment at 12 percent or less.
   c. Finger Jointing: Not allowed.
   d. Matching: Selected for compatible grain and color.

2.5 MISCELLANEOUS MATERIALS

A. Fasteners for Interior Finish Carpentry: Nails, screws, and other anchoring devices of type, size, material, and finish required for application indicated to provide secure attachment, concealed where possible.

B. Glue: Aliphatic-resin, polyurethane, or resorcinol wood glue recommended by manufacturer for general carpentry use.

1. Wood glue shall have a VOC content of 30 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Multipurpose Construction Adhesive: Formulation complying with ASTM D 3498 that is recommended for indicated use by adhesive manufacturer.

1. Adhesive shall have a VOC content of 70 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6 FABRICATION

A. Back out or kerf backs of the following members except those with ends exposed in finished work:

1. Interior standing and running trim except shoe and crown molds.
2. Wood-board paneling.

B. Ease edges of lumber less than 1 inch (25 mm) in nominal thickness to 1/16-inch (1.5-mm) radius and edges of lumber 1 inch (25 mm) or more in nominal thickness to 1/8-inch (3-mm) radius.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine finish carpentry materials before installation. Reject materials that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of projections and substances detrimental to application.

B. Before installing interior finish carpentry, condition materials to average prevailing humidity in installation areas for a minimum of 24 hours.

3.3 INSTALLATION, GENERAL

A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, too small to fabricate with proper jointing arrangements, or with defective surfaces, sizes, or patterns.

B. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.

1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining interior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.
4. Coordinate interior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate interior finish carpentry.

3.4 ADJUSTING

A. Replace interior finish carpentry that is damaged or does not comply with requirements. Interior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.5 CLEANING

A. Clean interior finish carpentry on exposed and semiexposed surfaces. Restore damaged or soiled areas and touch up factory-applied finishes, if any.

3.6 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.7 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.
1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.

2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 06 20 23

SECTION 06 40 23 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. A. This Section includes the following:
   1. Custom built wood cabinets (casework).
   2. Custom built plastic-laminate-covered cabinets (plastic-covered casework).

B. Related Sections: The following Sections contain requirements that relate to this Section:
   1. Division 6 Section "Rough Carpentry" for exposed framing and for furring, blocking, shims, and miscellaneous concealed interior woodwork.
   2. Division 6 Section "Finish Carpentry" for interior carpentry exposed to view that is not specified in this Section.
   3. Division 9 Section "Painting" for field finishing of installed interior architectural woodwork.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction prior to woodwork installation.

1.4 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of product and process specified and incorporated into items of architectural woodwork during fabrication, finishing, and installation.

C. Shop drawings showing location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcing specified in other Sections.
   2. Show locations and sizes of cutouts and holes for plumbing fixtures, faucets, soap dispensers, and other items installed in architectural woodwork.

D. Samples for initial selection of the following in the form of manufacturer's color charts consisting of actual units or sections of units showing the full range of colors, textures, and patterns available for each type of material indicated.

1. Shop-applied transparent finishes.
2. Plastic laminates.

E. Samples for verification of the following:
1. Lumber with transparent finish, 50 sq. in., for each species and cut, finished on one side and one edge.
2. Laminate-clad panel products, 8 by 10 inches, for each type, color, pattern, and surface finish, with separate samples of unfaced panel product used for core.
3. Solid laboratory countertop materials, 6 inches square.
4. Exposed cabinet hardware, one unit for each type and finish.

F. Product certificates signed by woodwork fabricator certifying that products comply with specified requirements.

G. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units without delaying the Work.

B. Installer Qualifications: Arrange for interior architectural woodwork installation by a firm that can demonstrate successful experience in installing architectural woodwork items similar in type and quality to those required for this Project.

C. Quality Standard: Except as otherwise indicated, comply with the following standard:
1. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grades of interior architectural woodwork, construction, finishes, and other requirements.

   a. Provide AWI Certification Labels or Certificates of Compliance indicating that woodwork meets requirements of grades specified.
2. The Contract Documents contain selections chosen from options in the Quality Standard as well as additional requirements beyond those of the Quality Standard. Comply with such selections and requirements in addition to the Quality Standard.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect woodwork during transit, delivery, storage, and handling to prevent damage, soilage, and deterioration.

B. Do not deliver woodwork until painting and similar operations that could damage, soil, or deteriorate woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas whose environmental conditions meet requirements specified in "Project Conditions."

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet-work is completed, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to be fitted to other construction, check actual dimensions of other construction by accurate field measurements before fabrication, and show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   1. Verify locations of concealed framing, blocking, reinforcements, and furring that support woodwork by accurate field measurements before being enclosed. Record measurements on final shop drawings.
   2. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating woodwork without field measurements. Provide allowance for trimming at site and coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PRODUCTS

2.1 MATERIALS

A. General: Provide materials that comply with requirements of the AWI quality standard for each type of woodwork and quality grade indicated and, where the following products are part of interior woodwork, with requirements of the referenced product standards that apply to product characteristics indicated:

B. Lumber: DOC PS 20 and the following grading rules:
   1. NeLMA: Northeastern Lumber Manufacturers' Association, "Standard Grading Rules for Northeastern Lumber."
   2. NLGA: National Lumber Grades Authority, "Standard Grading Rules for Canadian Lumber."

C. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.
   1. For exposed lumber, mark grade stamp on end or back of each piece, or omit grade stamp and provide certificates of grade compliance issued by inspection agency.

D. Hardboard: AHA A135.4.

MDF: ANSI A208.2, Grade 130 made with binder containing no urea-formaldehyde resin.

Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea-formaldehyde resin.

Melamine-Faced Particleboard: Particleboard complying with ANSI A208.1, Grade M-2, finished on both faces with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

1. Color: White.

H. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated, or if not indicated, as required by woodwork quality standard.
   1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering high-pressure decorative laminates that may be incorporated in the Work include, but are not limited to, the following:
      a. Wilsonart
      b. Formica Corporation.
      c. Laminart.
      d. Nevamar Corp.
      e. Pioneer Plastics Corp.
      f. Westinghouse Electric Corp.; Specialty Products Div.
      g. Ralph Wilson Plastics Co.

I. Adhesive for Bonding Plastic Laminate: Contact cement.

J. Adhesive for Bonding Plastic Laminate: Aliphatic resin.

CABINET HARDWARE AND ACCESSORY MATERIALS

General: Manufacturer's standard units complying with ANSI A156.9, of type, material, size, and finish as selected from manufacturer's standard choices.

1. Exposed Hardware Finishes: For exposed hardware, provide manufacturer’s standard satin finished or brushed aluminum.

B. Hardware Standard: Comply with BHMA A156.9 for items indicated by reference to BHMA numbers or referenced to this standard.

C. For concealed hardware provide manufacturer's standard finish that complies with product class requirements of BHMA A156.9.

D. Clear, Tempered Float Glass for Doors: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality q3; manufactured by horizontal (roller hearth) process, with exposed edges seamed before tempering, 6 mm thick, unless otherwise indicated.

E. Clear, Tempered Float Glass for Shelves: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality q3; with exposed edges seamed before tempering, 6 mm thick, unless otherwise indicated.

2.3 INSTALLATION MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Screws: Select material, type, size, and finish required for each use. Comply with ASME B18.6.1 for applicable requirements.

1. For metal framing supports, provide screws as recommended by metal-framing manufacturer.

C. Nails: Select material, type, size, and finish required for each use. Comply with FS FF-N-105 for applicable requirements.

D. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed steel or lead expansion bolt devices for drilled-in-place anchors.

2.4 FABRICATION, GENERAL

A. Interior Woodwork Grade: Provide interior woodwork complying with the referenced quality standard and of the following grade:
1. Grade: Custom.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to relative humidity conditions existing during time of fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:

1. Corners of cabinets and edges of solid-wood (lumber) members 3/4 inch thick or less: 1/16 inch.
2. Edges of rails and similar members more than 3/4 inch thick: 1/8 inch.

3. Corners of cabinets and edges of solid-wood (lumber) members and rails: 1/16 inch.

D. Complete fabrication, including assembly, finishing, and hardware application, before shipment to Project site to maximum extent possible. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

E. Shop-cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Smooth edges of cutouts and, where located in countertops and similar exposures, seal edges with a water-resistant coating.

F. Install glass to comply with applicable requirements of Division 8 Section "Glazing" and of FGMA "Glazing Manual." For glass in wood frames, secure glass with removable stops.

2.5 WOOD CABINETS (CASEWORK) WITH TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 400 requirements for wood cabinets. Joints of cabinets shall be multiple doweled, glued and screwed, with full frame top and solid bottom.

1. Grade: Custom.

B. AWI Type of Cabinet Construction: Reveal overlay.

C. Wood Species for Exposed Surfaces: Red oak, rift sawn/cut, unless noted otherwise.

1. Matching of Veneer Leaves: Slip match.
2. Veneer Matching Within Panel Face: Balance match.

D. Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other than Drawer Bodies: Match species and cut indicated for exposed surfaces.
2. Drawer Sides and Backs: Solid hardwood lumber, same species indicated for exposed surfaces, shop finished.
3. Drawer Bottoms: ¼ inch tempered hardboard.

2.6 PLASTIC LAMINATE FACE CASEWORK

A. Face Style: Reveal overlay.

B. Face Frame: 1-by-1-5/8-inch solid wood frame rails and stiles with glued mortise and tenon joints.

C. Concealed Surfaces: Sound and dry solid wood, plywood, or particleboard without defects affecting strength, utility, or stability.

D. Sides, Dividers, Tops, Bottoms, Shelves, and Stretchers: Plastic laminate GP 28 on 1/2-inch-thick particleboard. Provide stretchers for top of base cabinet.

E. Back Panels: 1/4-inch-thick hardboard with thermoset decorative panels on interior surfaces fastened to rear edge of end panels and to top and bottom rails.

F. Exposed Edge Treatment: Edge doors and drawer fronts with 3mm PVC edge banding. Color and finish to match plastic laminate of exposed faces.

G. Semi-Exposed Edge Treatment: Edge top of drawer body with high-impact plastic tee edging. Edge remaining casework surfaces with plastic laminate GP 28 matching adjoining plastic laminate in color, pattern, and finish.

H. Doors, Drawer Fronts, Fixed Panels, Toeboards, and Ends: Plastic laminate meeting NEMA GP 28 standard for vertical grade on 3/4-inch-thick particleboard.

I. Drawers: Fabricate with front, bottom, and back rabbeted in sides and secured with glue and mechanical fasteners as follows:
1. Subfronts, Sides, and Backs: 1/2-inch-thick particleboard.
2. Bottoms: Not less than 1/2-inch-thick particleboard.
3. Drawer Suspension: Provide for a minimum capacity of 75 lbf, with twin-track, side-mounted, drawer-glide suspension with nylon rollers. Provide self-closing feature and positive stop.

J. Joinery: Rabbet backs flush into end panels and secure with concealed mechanical fasteners. Connect tops and bottoms of wall cabinets and bottoms and stretchers of base cabinets to ends and dividers with mechanical fasteners. Rabbet tops, bottoms, and backs into end panels.

2.7 NOT USED

2.8 SHOP FINISHING OF WOOD CABINETS FOR TRANSPARENT FINISH

A. Quality Standard: Comply with AWI Section 1500, unless otherwise indicated.

1. Grade: Provide finishes of same grades as items to be finished.

B. General: The entire finish of wood cabinets is specified in this Section, regardless of whether shop applied or applied after installation.
   1. Shop Finishing: To the greatest extent possible, finish cabinets at the fabrication shop. Defer only final touch up, cleaning, and polishing until after installation.

C. Preparations for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

   1. Backpriming: Apply one coat of sealer or primer compatible with finish coats to concealed surfaces of woodwork, including backs of trim, cabinets, paneling, and ornamental work and the underside of countertops. Apply 2 coats to back of paneling. Concealed surfaces of plastic laminate-clad woodwork do not require backpriming when surfaced with plastic laminate or thermoset decorative overlay.

D. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.

E. Transparent Finish: Comply with requirements indicated below for grade, finish system, staining, and sheen, with sheen measured on 60-degree gloss meter per ASTM D 523.

   1. Grade: Custom.

2. AWI Finish System TR-4: Conversion varnish.
3. Staining: None required.
4. Sheen: Semigloss 55-75 gloss units.

PART 3 - EXECUTION

3.1 PREPARATION

A. Condition woodwork to average prevailing humidity conditions in installation areas before installing.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including back priming and removal of packing.

3.2 INSTALLATION

A. Quality Standard: Install woodwork to comply with AWI Section 1700 for the same grade specified in Part 2 of this Section for type of woodwork involved.

B. Install woodwork plumb, level, true, and straight with no distortions. Shim as required with concealed shims. Install to a tolerance of 1/8 inch in 96 inches

C. Scribe and cut woodwork to fit adjoining work and refinish cut surfaces or repair damaged finish at cuts.

D. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure to grounds, stripping and blocking with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails for exposed nailing, countersunk and filled flush with woodwork and matching final finish where transparent finish is indicated.

E. Cabinets: Install without distortion so that doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete the installation of hardware and accessory items as indicated.
   1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
   2. Maintain veneer sequence matching of cabinets with transparent finish.

F. Tops: Anchor securely to base units and other support systems as indicated. Calk space between backsplash and wall with specified sealant.
   1. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.

G. Complete the finishing work specified in this Section to the extent not completed at shop or before installation of woodwork. Fill nail holes with matching filler where exposed. Apply specified finish coats, including stains and paste fillers if any, to exposed surfaces where only sealer/prime coats were applied in the shop.

H. Refer to Division 9 Sections for final finishing of installed architectural woodwork.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork where possible to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

3.4 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to fabricator and Installer that ensures that woodwork is without damage or deterioration at the time of Substantial Completion.

3.5 WASTE MANAGEMENT

A. Coordinate with Division 01.
   1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
   2. Set aside and protect materials suitable for reuse and/or remanufacturing.
   3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

3.6 CABINET HARDWARE AND ACCESSORY SCHEDULE

A. BHMA numbers are used below to designate hardware requirements, except as otherwise indicated.

B. Butt Hinges: 2-3/4-inch, 5-knuckle steel hinges made from 0.095-inch-thick metal, and as follows:
   1. Semiconcealed Hinges for Overlay Doors: B01521.
   2. Rockford Process Control- #IH-375-26D
   3. Dull Chrome

C. Pulls: Contemporary Aluminum Edge Pull.
   1. Richelieu Hardware-Contemporary Edge Pull, 9595 -7 9/16”
   2. Stainless steel

D. Catches: As follows:
   1. Magnetic Catches: B03141.
   2. Push-in Magnetic Catches: B03131.
   3. Friction Catches: B03033.
   4. Ball Friction Catches: B03013.

E. Adjustable Shelf Standards: B04071.
   1. Shelf Rests for Standards: B04081.
   2. KV or equal -Heavy-duty stainless-steel single slotted adjustable shelf brackets and fasteners and shelf rests

F. Drawer Suspension: Epoxy coated self-closing drawer slides with nylon rollers, 2 stage positive stops, and rated for the following loads:
   1. Drawer Slides: 75 lbf.
   2. Self-closing

G. Door Locks: E07121. (ALL DOORS)

H. Drawer Locks: E07041. (ALL DRAWERS)

END OF SECTION 06 40 23

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SECTION 07 01 50 19 – PREPARATION FOR REROOFING

GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Partial tear-off of roof areas indicated on Drawings.
   2. Re-cover preparation of roof areas indicated on Drawings.

1.2 PREINSTALLATION MEETINGS

A. Preliminary Roofing Conference: Before starting removal Work, conduct conference at Project site.

1.3 INFORMATIONAL SUBMITTALS

A. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces, that might be misconstrued as having been damaged by reroofing operations.

   1. Submit before Work begins.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Approved by warrantor of existing roofing system to work on existing roofing.

1.5 FIELD CONDITIONS

A. Existing Roofing System: EPDM roofing.

B. Owner will occupy portions of building immediately below reroofing area.

   1. Conduct reroofing so Owner's operations are not disrupted.
   2. Provide Owner with not less than 72 hours' written notice of activities that may affect Owner's operations.
   3. Coordinate work activities daily with Owner so Owner has adequate advance notice to place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.

4. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below affected area.

    a. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.

C. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.

D. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

E. Conditions existing at time of inspection for bidding will be maintained by Owner as far as practical.

1. A roof moisture survey of existing roofing system is available for Contractor's reference.
2. The results of an analysis of test cores from existing roofing system are available for Contractor's reference.
3. Construction Drawings for existing roofing system are provided for Contractor's convenience and information, but they are not a warranty of existing conditions. They are intended to supplement rather than serve in lieu of Contractor's own investigations. Contractor is responsible for conclusions derived from existing documents.

F. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.

1. Remove only as much roofing in one day as can be made watertight in the same day.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during reroofing, by methods and with materials so as not to void existing roofing system warranty issued by existing warranted roof manufacturer.

PART 2 - PRODUCTS

2.1 AUXILIARY REROOFING MATERIALS

A. General: Use auxiliary reroofing preparation materials recommended by roofing system manufacturer for intended use and compatible with components of new roofing system.

PART 3 - EXECUTION

3.1 PREPARATION

A. Seal or isolate windows that may be exposed to airborne substances created in removal of existing materials.

B. Shut off rooftop utilities and service piping before beginning the Work.

C. Test existing roof drains to verify that they are not blocked or restricted.

1. Immediately notify Architect of any blockages or restrictions.

D. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work.

1. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

E. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.

F. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday.

1. Prevent debris from entering or blocking roof drains and conductors.

a. Use roof-drain plugs specifically designed for this purpose.
b. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

2. If roof drains are temporarily blocked or unserviceable due to roofing system removal or partial installation of new roofing system, provide alternative drainage method to remove water and eliminate ponding.

a. Do not permit water to enter into or under existing roofing system components that are to remain.

3.2 ROOF TEAR-OFF

A. Notify Owner each day of extent of roof tear-off proposed for that day and obtain authorization to proceed.

B. Lower removed roofing materials to ground and onto lower roof levels, using dust-tight chutes or other acceptable means of removing materials from roof areas.

C. Partial Roof Tear-off: Where indicated on Drawings, remove existing roofing down to existing cover board and immediately check for presence of moisture.

1. Owner will engage a qualified testing agency to perform the following test:

    a. Coordinate with Owner's testing agency to schedule times for tests and inspections immediately after removal.

3.3 DECK PREPARATION

A. Inspect deck after tear-off of roofing system.

B. If broken or loose fasteners that secure deck panels to one another or to structure are observed, or if deck appears or feels inadequately attached, immediately notify Architect.

    1. Do not proceed with installation until directed by Architect.

C. If deck surface is unsuitable for receiving new roofing or if structural integrity of deck is suspect, immediately notify Architect.

    1. Do not proceed with installation until directed by Architect.

3.4 ROOF RE-COVER PREPARATION

A. Remove blisters, ridges, buckles and other substrate irregularities from existing roofing that inhibit new recover boards from conforming to substrate.

END OF SECTION 070150.19

SECTION 07 13 26 - SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work performed under this Section includes the performance criteria, materials, production, and erection of Self-Adhering Sheet Waterproofing for the project and consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all Self-Adhering Sheet Waterproofing as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction including, but not limited to the following:

1. Modified bituminous sheet (below grade at outside face of foundations walls),
2. Bonded HDPE sheet for vertical applications.
3. Synthetic plastic hydrophilic expanding concrete water-stop.

B. Related Requirements:
1. Division 03 Concrete
2. Division 04 Masonry
3. Division 07 Thermal and Moisture Protection
4. Division 08 Openings

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Review weather barrier requirements including surface preparation, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, testing and inspection procedures, and protection and repairs.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, and tested physical and performance properties.
2. Include manufacturer's written instructions for evaluating, preparing, and treating substrate.

B. Shop Drawings: Show locations and extent of sheet waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

C. Samples: For each exposed product and for each color and texture specified, including the following products:

1. Mockup for each type of sheet waterproofing.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Field quality-control reports.

C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.

1. Build for each typical waterproofing installation including accessories to demonstrate surface preparation, crack and joint treatment, corner treatment, and protection.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.

1. Do not apply waterproofing in snow, rain, fog, or mist.

B. Maintain adequate ventilation during preparation and application of waterproofing materials.

1.8 WARRANTY

A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials an protection course, and molded-sheet drainage panels from single source from single manufacturer.

2.2 MANUFACTURERS

A. Basis of Design: CCW MiraDRI 860/861 Sheet Membrane Waterproofing as manufactured by Carlisle Coatings and Waterproofing Incorporated, 900 Hensley Lane, Wylie, Texas 75098, Phone: (800) 527-7092 Fax: (972) 442-0076.

B. Other products, as approved by Architect

1. CETCO Building Materials Group, a subsidiary of AMCOL International Corp;

2. Envirosheet., Meadows, W.R.,Inc; SealTight Mel-Rol.

2.3 PRODUCTS

A. Self-Adhesive Sheet Membrane Waterproofing: Shall be CCW MiraDRI 860/861consisting of a 56 mil rubberized asphalt membrane laminated to 4 mil cross-laminated polyethylene film, and shall meet or exceed the following requirements:

1. Tensile Strength: 325 psi minimum, ASTM D 412

2. Ultimate Elongation: 350% minimum, ASTM D 412

3. Puncture Resistance: 60 lbs. minimum, ASTM E 154

4. Permeance: 0.05 Perm maximum, ASTM E 96 (B)

5. Low Temperature Flexibility: Unaffected at -45oF, ASTM D 1970, 1" mandrel

6. Tensile to Film: 5000 psi, ASTM D 882

7. Thickness: 60 mils, ASTM D 3767

8. Hydrostatic Head: 230 ft., ASTM D 751

9. Water Absorption: 0.1% by wt., ASTM D 570

B. For application temperatures between 25 and 65oF, use CCW-861 Sheet Membrane and CCW-702. For application temperatures above 40°F use CCW MiraDRI 860 sheet membrane and CCW-702, CCW-714 primer, or CCW-AWP.

2.4 ACCESSORY PRODUCTS

A. Surface Primer: Shall be CCW-702LV Solvent-Based Contact Adhesive, 702WB or Cav-Grip. B.

B. Mastic: Shall be CCW-704 Mastic.

C. Sealants: Shall be CCW-703 Vertical Grade Liquiseal7 Membrane, one component approved sealant by CCW, CCW-201 two-component Polyurethane Sealant or CCW LM-800XL

D. Backing Rod: Shall be closed-cell polyethylene foam rod.

E. Protection Course: Shall be CCW Protection Board-H or CCW 300H for horizontal surfaces or CCW Protection Board-V or CCW 200V for vertical surfaces.

F. Drainage Composite: Shall be CCW MiraDRAIN 6200 as recommended by the manufacturer for each condition.

G. Perimeter Drainage System: Where required shall be CCW QuickDRAIN™.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Before any waterproofing work is started the waterproofing applicator shall thoroughly examine all surfaces for any deficiencies. Should any deficiencies exist, the architect, owner, or general contractor shall be notified in writing and corrections made.

B. Condition of Concrete Surfaces:
   1. The concrete surfaces shall be of sound structural grade and shall have a smooth finish, free of fins, ridges, protrusions, rough spalled areas, loose aggregate, exposed course aggregate, voids or entrained air holes. Rough surfaces shall receive a well-adhered parget coat.
   2. Concrete shall be cured by water curing method. Any curing compounds must be of the pure sodium silicate type and be approved by the Carlisle representative.
   3. Concrete shall be cured at least 7 days and shall be sloped for proper drainage.
   4. Voids, rock pockets and excessively rough surfaces shall be repaired with approved non- shrink grout or ground to match the unrepaired areas.
   5. Two-stage drains shall have a minimum 3 inch flange and be installed with the flange flush and level with the concrete surface.
   6. Surfaces at cold joints shall be on the same plane.

3.2 SURFACE PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application. The concrete surface must be thoroughly clean, dry and free from any surface contaminates or cleaning residue that may harmfully affect the adhesion of the membrane.

B. Install a 3/4" face, 45 degree cant of CCW-201 Polyurethane Sealant or CCW LM-800XL at all angle changes and inside corners including penetrations through the deck, walls, curbs, etc.

C. All cracks over 1/16" in width and all moving cracks under 1/16" in width shall be routed out to 1/4" minimum in width and depth and filled flush with an approved sealant by CCW or CCW-201 polyurethane sealant.

D. All expansion joints less than 1" wide shall be cleaned, primed, fitted with a backing rod and caulked with CCW-201 Polyurethane Sealant. For larger joints, contact Carlisle representative.

E. Allow all sealant to cure at least overnight.

F. Stir Primer. Apply a thin film of primer 10" wide, centered over sealed cracks and joints, hairline cracks, and cold joints. Apply primer 8" on each side of all corners. Prime concrete around drain flanges. Allow primer to dry per manufacturer=s recommendations.

G. Install an 8" wide strip of CCW MiraDRI 860/861centered over joints and cracks. Install a 12" wide strip of CCW MiraDRI 860/861centered over the axis of all corners.

H. Terminate membrane around drains per CCW MiraDRI 860 series details. Terminate the membrane under the clamping ring. Seal all edges with CCW-704 Mastic. Do not interfere with weep holes.

3.3 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

A. Priming: Clean surfaces to remove residual dust before priming. Stir primer. Apply by spray or roller at a rate recommended by manufacturer. Allow to dry per manufacturer=s recommendation.

B. Horizontal surfaces: Install sheet membrane from low to high point, so that laps will shed water. Overlap edge seams 2½", end laps 5". Stagger end seams. Roll in place with an 18 to 24" wide, 100 lb. (min.) resilient roller. Ensure that all laps are firmly adhered and that there are no gaps or fishmouths.

C. Vertical Surfaces: Apply in lengths of 8' or less. Overlap edge seams 2½". On walls over 8' high, apply in 8' sections, starting at the lowest point with the higher section overlapping the lower section 5". Roll in place using firm pressure with a hand roller.

D. Terminations: Consult Carlisle 860-9 Details for proper terminations. Roll terminating edges firmly. Apply CCW-704 mastic to all terminations and >T= joints. Apply CCW-704 Mastic or CCW-703-V Liquiseal to laps at angle changes, extending 9" in each direction.

3.4 INTEGRITY TESTING

A. Test is required for all expanded warranties beyond the standard material warranty of horizontal applications.

B. The test can be done with Electronic Vector Mapping or flood testing. Flood testing requires 2” minimum head of water for a period of 24 hours

3.5 PROTECTION COURSE

A. VERTICAL APPLICATION: Install CCW QuickDRAIN Perimeter Drainage System as the first course of drainage composite immediately after membrane has been installed on vertical surfaces. Install CCW MiraDRAIN Drainage Composite (consult CCW for recommendation), CCW Protection Board-V Protection Course or CCW 200V on remainder. Stop drainage composite 6" below final grade level.

B. HORIZONTAL APPLICATION: Install CCW MiraDRAIN Drainage Composite (consult CCW for recommendation) or CCW Protection Board-H Protection Course or CCW 300HV immediately after flood testing on horizontal surfaces. If flood testing is delayed, install a temporary covering to protect the CCW MiraDRI 860/861membrane from damage by other trades.

3.6 PROTECTION, REPAIR, AND CLEANING

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

3.7 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 07 13 26

SECTION 07 21 00 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the performance criteria, materials, production, and erection of Thermal Insulation for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all Thermal Insulation as required by the this section, schedules, keynotes and drawings including, but not limited to the following:

1. Foam-plastic board insulation.
2. Mineral-wool blanket insulation.
3. Glass fiber blanket insulation.
4. Sprayed polyurethane foam insulation

B. Related Requirements:

1. Division 04 “Masonry”
2. Division 07 “Thermal and Moisture Protection”
3. Division 09 “Finishes”

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Research/evaluation reports.

PART 2 - PRODUCTS

2.1 MATERIAL, GENERAL

A. Source Limitations: Obtain insulation materials from single source from single manufacturer.

B. Must meet NYS Energy Code requirements.

2.2 FOAM-PLASTIC BOARD INSULATION – ABOVE GRADE

A. For use on above grade cavity walls: Exterior Insulation: Glass-fiber-reinforced enhanced polyisocyanurate foam core sheathing faced with nominal 4 mil embossed blue acrylic-coated aluminum on one side and 1.25 mil embossed aluminum on the other side, complying with ASTM C1289 and meeting the following physical properties:
   1. ASTM C1289 Type 1, Class 2
   2. Compressive Strength (ASTM D1621): 25 psi, minimum.
   3. Aged Thermal Resistance (ASTM C518, measured at Mean Temp of 75F): [R-6.5 at 1 inch] [RSI 1.06 per 25 mm] of thickness [with 15 year thermal warranty]
   4. Flexural Strength (ASTM C203): Minimum 55 psi.
   5. Water Absorption (ASTM C209): Maximum.0.1 percent by volume.
   6. Water Vapor Permeance (ASTM E96): <0.03 perms.
   7. Maximum Use Temperature: 250 degrees F.
   8. Panel Size: 4'-0" wide x 8'-0" long, square edge, shiplap
   9. Thickness and Stabilized R-Value: Nominal 2 inch thickness, R-13.0
   10. Wall assembly must comply with NFPA 285 - 2012

B. Manufacturers subject to compliance with requirements, provide products by one of the following:
   1. Basis of Design: Dow Chemical Company "THERMAX ci Exterior Insulation.
   2. Other comparable products as approved by Architect

C. Accessories:
   1. Fasteners: Provide insulated sheathing manufacturer's recommended polymer or other corrosion protective coated steel screw fasteners for anchoring sheathing to metal wall framing. Fastener length and size based on wall sheathing thickness.
      a. Basis of Design: Rodenhouse, Inc. 2 inch diameter "Thermal-Grip" CI prong washer with "Grip-Deck" ceramic- coated, self-drilling screw.
      b.Use the Grip-Lok auto-feed fastening system for high speed application

D. Flashing: Provide insulation manufacturer's recommended board treatment for sealing joints, seams, and veneer tie penetrations through the insulation layer.
   a. Acceptable Products:
      1) Dow Chemical Company LIQUIDARMOR-CM commercial liquid flashing and sealant.
      2) Dow Chemical Company "WEATHERMATE Straight Flashing 4 inch"width with butyl rubber adhesive

E. Wall Opening Flashing: Provide insulated sheathing manufacturer's recommended flashing sealing window and door wall openings.
   a. Acceptable Products:
   1) Dow Chemical Company LIQUIDARMOR-CM commercial liquid flashing and sealant
   2) Dow Chemical Company "WEATHERMATE Straight Flashing 6 inch and 9 inch", with butyl rubber adhesive, at straight opening heads, jambs and sills
   3) When greater widths are required for through wall flashings butyl rubber adhesive is recommended.

F. Penetration Filler: Provide insulated sheathing manufacturer's recommended polyurethane foam for sealing penetrations of insulated sheathing.

a. Acceptable Products:
1) Dow Chemical Company "GREAT STUFF PRO Gaps & Cracks" single Component polyurethane insulating foam sealant.
2) Dow Chemical Company "GREAT STUFF PRO Window & Door" single-component polyurethane low-pressure foam sealant

G. Gap Air Infiltration Filler: Two Component, Quick Cure Polyurethane Foam:
1. Acceptable Products:
a) Dow Chemical Company FROTH-PAK Foam Insulation two component, quick-cure polyurethane foam
i) NFPA 286 Approval for Exposed use to the interior of the building without the need for a15-min thermal barrier
ii) ASTM E-84 Class A

H. Flexible polyethylene foam gasket strip to reduce air infiltration between a concrete foundation and sill plate.
a. Acceptable Products: The Dow Chemical Company "STYROFOAM Sill Seal Foam Gasket

2.3 FOAM -PLASTIC BOARD INSULATION – BELOW GRADE

A. For use below grade and under slab: Rigid closed-cell Extruded-Polystyrene Board Insulation for Perimeter Foundation Wall Installations

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Basis of Design: Dow Chemical Company Perimate Square Edge
   b. DiversiFoam Products.
   c. Owens Corning.
   d. Pactiv Building Products.
2. Wall assembly must comply with NFPA 285 - 2012.
3. ASTM C578-92 Type IV, 25 psi (ASTM D 1621-73)
4. Density 1.6 lb/cu. Ft. min
5. Thickness 2" unless otherwise indicated
6. UL classification: D369.
7. Thermal resistance: 5-year aged R-values of 5.4 and 5.0 min., $^{o}F\text{-}ft^2\text{-}h/Btu^2/inch$ at $40^{o}F$ and $75^{o}F$ respectively (ASTM C 518-91).
8. Water absorption: Max. 0.3% by volume (ASTM C 272-91).

2.4 MINERAL-WOOL BOARD INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fibrex Insulations Inc.
2. Isolatek International.
3. Owens Corning.
4. Roxul Inc.
5. Thermafiber.

B. Unfaced, Mineral-Wool Board Insulation (at cavity wall edge of slab, fire-safing conditions): ASTM C 612; with maximum flame-spread and smoke-developed indexes of 15 and zero, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

C. Foil-faced, Mineral-Wool Board Insulation (at storefront wall edge of slab and spandrel panel locations): ASTM C612; faced on one side with foil-scrim or foil-scrim-polyethylene vapor retarder; with maximum flame-spread and smoke – developed indexes of 25 and 5, respectively, per ASTM E84.

2.5 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation.
2. Guardian Building Products, Inc.
3. Johns Manville.
4. Knauf Insulation.
5. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.6 MINERAL-WOOL BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Fibrex Insulations Inc.
2. Owens Corning.
3. Roxul Inc.
4. Thermafiber.

B. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

2.7 SPRAYED POLYURETHANE FOAM INSULATION

A. Spray Polyurethane Foam Installer shall be certified by spray foam manufacturer.

B. Pre-Installation Meeting to review spray polyurethane foam methods and procedures related to application, including manufacturer's installation guidelines.

C. Mock-up illustrating typical conditions. Conduct the following tests on the mockup panel:
1. Core density
2. Adhesion between transition sheet membrane and substrate
3. Cohesion or adhesion between sprayed insulation and substrate

D. Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during any 24 hours after application to maintain non-toxic, unpolluted, safe working condition.

E. Protect workers as recommended by insulation manufacturer.

F. Protect adjacent surfaces and equipment from damage by overspray, fall-out and dusting of insulation materials.

G. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Basis of Design: Dow Chemical Styrofoam Spray Polyurethane Foam Insulation (MX Series)
   2. Certa Spray Closed Cell Foam Insulation by CertainTeed
   3. Icynene ProSeal MD-C-200v3
   4. Substitutions: Approved equal

H. Spray Polyurethane Foam: Two-component spray polyurethane cellular plastic foam, complying with the following methods and meeting the following physical properties:

   1. Core Density (ASTM D1622): Minimum 2pcf
   2. Thermal Resistance (ASTM C518): 140degreeF/90day Aged R-Value, measured at 75F mean Temp: Minimum R6.0/inch.
   3. Flame Spread (ASTM E84, Class A): 25 or less.
   4. Smoke Developed (ASTM E84, Class A): 450 or less.
   5. Compressive Strength minimum (ASTM D1621, 10% parallel to rise): (20 psi)(182 kPa).
   6. Closed Cell Content (ASTM D2856): minimum 95 percent.
   7. Water Absorption by Volume maximum. (ASTM D2842): 2.5 percent.
   8. Wall assembly must comply with NFPA 285 - 2012

I. For oily steel surface like Z-bar, roof deck, curtain wall pan, aluminum tube or PVC pipes cleaning, etching or a primer may be needed before spraying polyurethane foam. Water Vapor Permeability maximum. (ASTM E96): [2.5 perm-inches] [3.6 ng/(Pa.s.m)].

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.2 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 36 inches (915 mm) below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

1. If not otherwise indicated, extend insulation a minimum of 36 inches (915 mm) in from exterior walls.

C. Cut insulation to fit snugly around pilasters, projections, curves and irregularities on the wall surface. Fill voids with insulation.

3.3 INSTALLATION OF CAVITY-WALL INSULATION

A. Foam-Plastic Board Insulation: Install 2” diameter daubs of adhesive spaced approximately 12 inches (610 mm) o.c. both ways on inside face, and as recommended by manufacturer. Fit courses of insulation between wall ties and other obstructions, with edges butted tightly in both directions. Press units firmly against inside substrates.

1. Supplement adhesive attachment of insulation by securing boards with two-piece wall ties designed for this purpose and specified in Section 042000 "Unit Masonry."

2. Wedge insulation from outside wythe of construction with small fragments of masonry materials spaced 24" o.c. both ways.

3. Make insulation continuous. Fill all voids

3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

C. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.

2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. For metal-framed wall cavities where cavity heights exceed 96 inches (2438 mm), support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.

    a. Exterior Walls: Set units with facing placed toward as indicated on Drawings.
    b. Interior Walls: Set units with facing placed as indicated on Drawings.

D. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:

1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

3.5 INSTALLATION OF INSULATION FOR CONCRETE SUBSTRATES

A. Install board insulation on concrete substrates by adhesively attached, spindle-type insulation anchors as follows:

1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.
2. Apply insulation standoffs to each spindle to create cavity width indicated between concrete substrate and insulation.
3. After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.
4. Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

3.6 INSTALLATION OF STOREFRONT-WALL INSULATION

A. Install board insulation in storefront-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.

1. Hold insulation in place by securing metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass.
2. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

3.7 INSTALLATION OF VAPOR RETARDERS

A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.

1. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches (406 mm) o.c.
2. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
3. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.

C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.8 INSTALLATION OF FOAM INSULATION

A. Verify existing conditions are ready to receive work.

B. Ensure surfaces are free of frost, oil, grease, oxidation, dirt, loose paint, loose scale, or other deleterious material that would impair bond.

C. Ensure that items required to penetrate sprayed insulation are installed prior to installation of sprayed insulation.

D. Clean area of work prior to application of sprayed insulation. Beginning of application implies acceptance of existing conditions.

E. Mask and cover adjacent areas to protect from overspray.

F. Apply any required primers for special conditions as recommended by manufacturer. Prepare surfaces within the exterior soffit at the pool to receive sprayed foam insulation where indicated.

G. Cover wide joints with transition sheet membrane as specified in Section 07 27 50.

H. Seal any voids between the existing precast concrete T’s and adjoining building components.

I. Must be installed by manufacturer’s Approved Applicator at time of bidding.

J. Apply SPF in accordance with ASTM C1029 and manufacturer's installation guidelines: complying with preparation methods.

K. Apply sprayed foam insulation in consecutive layers of not less than ½ inch and not more than 2 inch thick each to achieve total thickness required (total thickness as indicated per application) for a minimum R value of 25. For light gage steel and extruded polystyrene board first layer should be a skim coat of (12 mm) (½ inch) before adding extra layers. Ensure the substrate is well supported.

L. Avoid formation of sub-layer air pockets.

M. Apply product in overlapping layers, so as to obtain a smooth, uniform surface.

N. Maintain 3 inch clearance around chimneys, heating vents, steam pipes, recessed lighting fixtures and other heat sources.

O. Do not apply Product to inside of exit openings or electrical junction boxes.

P. Conduct field inspection and testing in accordance with manufacturers and general contractors instructions.

Q. Test completed application daily for core density and cohesion/adhesion to substrate. Record results daily in daily work records.

R. Site Tolerances: Maximum Variation in Applied Thickness: minus 1/4 inch, plus 5/8 inch.

S. Remove overspray from non-prescribed surfaces without causing damage to surfaces.

T. Remove protective covers from adjacent surfaces.

U. Protect completed installation from damage Repair as required.

V. Any open flame or welding shall not be in contact with the Spray Polyurethane Foam.

W. All plastic insulation must be protected from interior occupancy space by an approved thermal barrier to meet the requirements of local Building Codes.

3.9 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.
   1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
   2. Set aside and protect materials suitable for reuse and/or remanufacturing.
   3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 07 21 00

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SECTION 07 27 26 – FIRE RESISTANT, FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

A. A fluid-applied membrane and accessory products of inherent, fire-resistant composition for use as an air barrier in exterior walls.

B. Materials and installation to bridge and seal the following air leakage pathways and gaps:
1. Connections of the walls to the roof air barrier
2. Connections of the walls to the foundations
3. Seismic and expansion joints
4. Openings and penetrations of window frames, door frames, store front, curtain wall
5. Barrier pre-cast concrete and other envelope systems
6. Door frames Piping, conduit, duct and similar penetrations
7. Masonry ties, screws, bolts and similar penetrations
8. All other air leakage pathways through the walls

1.3 RELATED SECTIONS

A. Section 03 30 00 Cast-in-place Concrete

B. Section 04 22 00 Concrete Unit Masonry

C. Section 07 21 00 Thermal Insulation

D. Section 07 27 13 Self Adhering Membrane Air Barriers

E. Section 07 54 23 TPO Roofing

F. Section 07 92 00 Joint Sealants

G. Section 08 11 13 Hollow Metal Doors and Frames

H. Section 08 51 13 Aluminum Windows

I. Section 09 29 00 Gypsum Board

1.4 REFERENCES

A. American Association of Textile Chemists and Colorists (AATCC) Test Method 127. “Water Resistance – Hydrostatic Pressure Test”

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Standard 90.1-2010 “Energy Standard for Buildings Except Low-Rise Residential Buildings”

C. ASTM C 920 Standard Specification for Elastomeric Joint Sealants

D. ASTM C 1305 Standard Test Method for Crack Bridging Ability of Liquid-Applied Waterproofing Membrane

E. ASTM C 1522 Standard Test Method for Extensibility after Heat Aging of Cold, Liquid-Applied Elastomeric Waterproofing Membrane

F. ASTM D 1970 Standard Specification for Self-Adhering Polymer Modifed Bituminous Sheet Materials Used as Steep slope roofing Underlayment for Ice Dam Protection.

G. ASTM D 4541 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

H. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials

I. ASTM E 96 Standard Test Methods for Water Vapor Transmission of Materials.

J. ASTM E 783 Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors

K. ASTM E 1105 Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform or Cyclic Static Air Pressure Difference

L. ASTM E 1354 Standard Test Method for Heat and Visible Smoke Release Rates for Materials and Products Using an Oxygen Consumption Calorimeter

M. ASTM E 2178 Standard Test Method for Air Permeance of Building Materials

N. ASTM E 2357 Standard Test Method for Determining Air Leakage of Air Barrier Assemblies

P. National Fire Protection Association (NFPA) 285 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components

1.5 MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.

B. Shop Drawings and Submittals:

1. Provide evidence to the Architect of licensing and certification under the Air Barrier Association of America's (ABAA's) Quality Assurance Program.
2. Submit shop drawings showing locations and extent of air/vapor barrier and details of all typical conditions, intersections with other envelope systems and materials, membrane counter-flashings, and details showing how gaps in the construction will be bridged, how inside and outside corners are negotiated and how miscellaneous penetrations such as conduits, pipes electric boxes and the like are sealed.
3. Submit manufacturer's product data sheets for each type of membrane, including manufacturer's printed instructions for evaluating, preparing, and treating substrate, temperature and other limitations of installation conditions, technical data, and tested physical and performance properties.
4. Submit manufacturer's data showing solids content of fluid applied membranes and coverage rates and wet film thickness upon application in order to achieve minimum dry film thickness required by this specification.
5. Submit manufacturer's installation instructions.
6. Submit certification of compatibility by air/vapor barrier manufacturer, listing all materials on the project that it connects to or that come in contact with it.
7. Submit samples, 3 by 4 inch minimum size, of each air/vapor barrier material required for Project. Apply sample material to substrate to used on project.
8. Test results of air permeability testing of primary air barrier material (ASTM E 2178-01)
9. Test results of assembly in accordance with ABAA test protocol.

1.7 PERFORMANCE REQUIREMENTS

A. Installed product and accessories constitute a continuous air barrier, as described in ASHRAE Standard 90.1-2010 Section 5.4.3.1

B. Installed product and accessories shall perform as a liquid water drainage plane flashed to discharge to the exterior any incidental condensation or water penetration.

C. Installed product and accessories shall exhibit an air leakage rate, infiltration and exfiltration modes, measured after pressure cycling, not to exceed 0.2 $L/s*m^2$ at 75 Pa (0.040 CFM/ft^2 at 1.57 PSF) according to ASTM E 2357.

D. Exterior wall assemblies incorporating the product and accessories shall be tested in accordance with and comply with the acceptance criteria of NFPA 285.

E. Product shall be of flame-retardant, non-asphalt synthetic polymer composition.

F. Product shall be a nominal 0.040 inch (40 mils) thickness membrane, with dry film thickness of installed product measuring a minimum of 0.030 inch (30 mils) with a comb gauge.

G. Product shall meet the following requirements:

REQUIREMENT	RESULT	TEST METHOD
Air Permeance – on Porous Substrate	Not more than 0.02 L/s*m^2 at 75 Pa (0.004 CFM/ft^2 at 1.57 PSF)	ASTM E-2178, mod sprayed on CMU
Air Permeance – Free Film	Not more than 0.02 L/s*m^2 at 75 Pa (0.004 CFM/ft^2 at 1.57 PSF)	ASTM E-2178
Low Temperature Flexibility	No cracking at minus 20 degrees F, 180 degree bend over 1 inch mandrel	ASTM D 1970
Low-Temperature Crack Bridging	No cracking after 10 cycles at minus 15 deg F	ASTM C 1305, mod 40 mil membrane thickness
Long-Term Aging/ Flexibility	No cracking or tearing after aging	ASTM C 1522, mod 40 mil membrane thickness OR CGSB 71-GP-24M
Fastener Sealability	No water leaking through nail penetration after 24 h.	ASTM D 1970
Water Resistance	Product spray-applied to CMU and gypsum sheathing with joint shall resist a 55 cm (22 inch) column of water for 5 hours, no leaking or wet through.	AATCC-127 - mod, static head generated with 5”diameter PVC pipe sealed to specimen
Pull Adhesion	Not less than 16 lbf per square inch (or report value at substrate failure) on glass-faced gypsum sheathing	ASTM D 4541, modified 4 inch wood puck
Water Vapor Permeance – Vapor Permeable Type Only	Not less than 10 Perms	ASTM E-96, Method B
Surface Burning Characteristics.	Flame Spread Index: Not more than 25 Smoke Generation Index: Not more than 450	ASTM E 84, sample tested at full coverage, 40 mil dry film, cement board substrate

Measurement of Heat Release Rate by Cone Calorimeter	Average Effective Heat of Combustion: Not more than 12.3 MJ/kg [5,300 BTU/lb] Total Heat Released per Area: not more than 14.7 MJ/m^2 [1,296 BTU/ft^2]	ASTM E 1354, membrane applied to glass-faced gypsum sheathing

1.8 QUALITY ASSURANCE

A. Installer Qualifications:

1. The air barrier contractor shall be, during the bidding period as well as for the duration of the installation, officially recognized as a Licensed Contractor by the Air Barrier Association of America (ABAA). The contractor shall carry liability insurance and bonding.

2. Each worker who is installing air barriers must be either a Certified Applicator or an installer who is registered with ABAA.

3. Each Lead Certified Applicator can supervise a maximum of five registered installers. The Certified Applicator shall be thoroughly trained and experienced in the installation of air barriers of the types being applied. Lead Certified Applicators shall perform or directly supervise all air/vapor barrier work on the project.

B. Air/vapor barrier installers must be trained and certified by NECA (National Energy Conservation Association) and PSDI (Professional Skills Development Institute for energy conservation)

C. Single-Source Responsibility: Obtain air/vapor barrier materials from a single manufacturer regularly engaged in manufacturing the product.

D. Manufacturer shall be on-site at least once a week to observe installation and provide written report within 3 days.

E. Manufacturer shall confirm all termination details and compatibility with materials being terminated to.

F. Mockups: Build mockups to set quality standards for materials and execution and for preconstruction testing.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.

B. Mockup testing for qualitative air leakage, quantitative air leakage, and adhesion.

C. Field-Constructed Mock-Ups: Prior to installation of air/vapor barrier, apply air/vapor barrier as follows to verify details under shop drawing submittals and to demonstrate tie-ins with adjoining construction, and other termination conditions, as well as qualities of materials and execution:

1. Construct typical exterior wall panels, size and location as shown on drawing, (one of concrete and one of sheathed areas), incorporating back-up wall, opaque cladding, window frame, insulation, flashing, building corner condition, and typical penetrations and gaps; illustrating materials interface and seals.

2. The joints between fenestration product and adjacent wall construction shall be included in the test assembly. Interior wall materials shall not be installed to allow visual access to test area check for leakage.

D. Test mock-ups in accordance with ASTM E783 and ASTM E1105 for air and water infiltration. Approval of all test procedure, remediation measures (if required) and test results rests with the Architect/Owner. Failure criteria shall be defined in the Test Method.

1. The intent of the mock-ups is to identify potential problem areas before the general wall assembly construction is complete so concrete measures (if required) can be taken with minimal impact to construction in-place.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Remove and replace liquid materials that cannot be applied within their stated shelf life.

B. Refer to current Product MSDS for proper storage and handling.

C. Deliver materials to the job site in undamaged and original packaging indicating the name of the manufacturer and product.

D. Store roll materials on end in original packaging. Protect rolls from direct sunlight until ready for use.

E. Store air barrier membranes, adhesives and primers at temperatures of 40 degrees min.

F. Protect stored materials from direct sunlight.

G. Keep solvent away from flame or excessive heat.

1.11 FIELD CONDITIONS

A. Do not apply product or accessories during rain or accumulating snowfall.

B. Apply product and accessories within approved ambient and substrate temperature range stated in manufacturer's literature.

C. Do not apply product or accessories over incompatible materials.

D. Observe safety and environmental measures indicated in manufacturer's MSDS, and mandated by federal, state and local regulations.

1.12 WARRANTY

A. System Warranty: Provide the manufacturer's five (5) year system warranty, including the primary air/vapor barrier and installed accessory sealant and membrane materials which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 - PRODUCTS

2.1 FIRE-RESISTANT, FLUID APPLIED MEMBRANE AIR BARRIERS

A. **TO BE INSTALLED ABOVE GRADE FOR CMU WALLS BEHIND BRICK**

B. Basis of Design: Carlisle Coatings & Waterproofing, Incorporated. 900 Hensley Lane, Wylie, TX 75098. Phone 1-800-527-7092. Website http://www.carlisle- ccw.com
1. Vapor-Permeable Type: Fire Resist Barritech VP

C. Other manufacturers and products, as approved by Architect

2.2 ACCESSORIES

A. Provide from same manufacturer as air barrier membrane

B. Detail Flashing: Foil-faced butyl or foil-faced rubberized asphalt flashing, minimum 0.030" (30 mils) thickness. Approved with air barrier membrane in NFPA 285 wall assemblies.
1. AlumaGRIP-701 by Carlisle Coatings & Waterproofing, Incorporated
2. Others as approved by air barrier membrane manufacturer

C. Contact Adhesive:

1. Carlisle Coatings & Waterproofing, Incorporated: CCW-702 Solvent- Based, CCW-702 LV VOC Compliant Solvent-Based, CCW-702 WB Water-Based, CAV-GRIP™ Aerosol Spray or Travel-Tack portable aerosol spray cans
2. Products by others as approved by Architect.

D. Detail Mastic:
1. SURE-SEAL Lap Sealant by Carlisle Coatings & Waterproofing, Incorporated
2. Products by others as approved by Architect

E. Transition Membrane:
1. CCW SURE-SEAL Pressure-Sensitive Elastoform by Carlisle Coatings & Waterproofing, Incorporated
2. Products by others as approved by Architect

F. Transition Membrane Primer:
1. Carlisle Coatings & Waterproofing, Incorporated: SURE-SEAL HP-250 Primer, SURE-SEAL EP-95 Splicing Cement or SURE-SEAL Low VOC EPDM Primer
2. Products by others as approved by Architect

G. Reinforcing Fabric: Woven, synthetic polymer fabric
1. DCH Reinforcing Fabric by Carlisle Coatings & Waterproofing, Incorporated
2. Products by others as approved by Architect

H. Glass Mat: Randomly-oriented glass strands held in binder soluble in wet air barrier membrane. Offered in rolls of various widths
1. LiquiFiber-W
2. Products by others as approved by Architect

I. Fill Compound: 2-part, non-sag polyurethane sealant
1. Carlisle Coatings & Waterproofing, Incorporated: CCW-703 V or CCW-201
2. Products by others as approved by Architect

2.3 RELATED MATERIALS

A. Paintable Sealant, select any:
1. Sikaflex-1A 1-part polyurethane sealant
2. Sonneborn NP-1 1-part polyurethane sealant
3. ChemLink Novalink 1-part polyether sealant
4. Pecora AC-20 outdoor grade, acrylic latex sealant
5. DAP ALEX PLUS outdoor grade, acrylic latex sealant
6. Other product approved by air barrier membrane manufacturer

B. Silicone Sealant, select any:
1. Dow 790, 791, 795
2. Pecora 890, 891, 895
3. GE Silpruf, Silpruf LM
4. Other product approved by air barrier membrane manufacturer

C. Polyurethane Foam Sealant, select any:
1. Great Stuff by Dow Chemical Company
2. Froth Pack by Dow Chemical Company
3. Other product approved by air barrier membrane manufacturer

D. Insulation Adhesive, select any
1. Sonneborn Premium Adhesive
2. QB-300 Multi-Pupose Construction Adhesive by OSI
3. PL-300 VOC Foamboard Adhesive by Loctite
4. Other product approved by air barrier membrane and board foam insulation manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the System. Examine substrates, areas, and conditions affecting installation of the air & vapor barrier and

accessory products for compliance with requirements. Verify that surfaces and conditions are suitable prior to commencing Work of this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Verify that wall assemblies are dried in, such that water intrusion will not occur from above, behind or around the air barrier installation.

C. Concrete shall be cured for a minimum of seven days. It shall be smooth, with sharp protrusions such as form joints ground flush. Honeycomb and holes/cracks exceeding ¼ inch across shall be filled with grout or mortar.

D. Surfaces shall be sound, dry and free of oil, grease, dirt, excess mortar or other contaminants.

E. Surfaces shall be supported and flush at joints without large voids or sharp protrusions.

F. Mortar joints shall be struck flush and shall be free of voids exceeding ¼ inch across. Mortar droppings shall be removed from brick ties and all other surfaces accepting air barrier.

G. Sheathing boards shall be flush at joints, with gaps between boards according to building code and sheathing manufacturer's requirements. Sheathing boards shall also be securely fastened to the structure with proper fastener type, technique and spacing according to building code and sheathing manufacturer's requirements. Sheathing boards shall be repaired or replaced if inspection reveals moisture damage, mechanical damage or if sheathing boards have exceeded the exposure duration or exposure conditions as required by the sheathing manufacturer.

H. Plywood, OSB, lumber or pressure-treated wood moisture content, measured with a wood moisture meter in the core of the substrate, shall be below 20%.

I. Inform Architect in writing of
1. Cracks in concrete and masonry.
2. Gaps or obstructions such as steel beams, angles, plates and projections which cannot be spanned or covered by Product or Accessories.
3. Anticipated problems applying product and accessories over substrate.

3.2 SURFACE PREPARATION

A. Concrete masonry unit (CMU) wall shall be prepared as follows to accept the air & vapor barrier:
1. Surfaces shall be free of contaminants such as grease, oil and wax on surfaces to receive membrane
2. The CMU surfaces shall be free from projections.
3. Strike all mortar joints flush to the face of the concrete block.
4. Fill all voids and holes greater than ¼ inch across at any point with mortar, sealant or other approved fill material.
5. Surface irregularities exceeding ¼ inch in height or sharp to touch shall be ground flush or made smooth.
6. Fill around all penetrations with mortar, sealant or other approved fill material and strike flush.

7. If the surfaces cannot be made smooth to the satisfaction of the Architect, it will be the responsibility of the trade to alternatively apply a parge coat (typically one part cement to three parts sand) over the entire surface to receive Air & Vapor Barrier Membrane
8. Remove mortar droppings on brick ties, shelf angles, brick shelves or other horizontal obstructions.

B. Fill cracks, gaps and joints exceeding ¼ inch width with fill compound or paintable sealant.

C. Fill rough gaps around pipe, conduit and similar penetrations with mortar, non-shrink grout, fill compound or polyurethane foam sealant shaved flush.

D. Apply a ¾ inch cant of fill compound at the intersection of the base of the wall and the footing.

3.3 DETAILING

A. Additional materials and installation are required at joints, transitions, openings, terminations, penetrations and similar surface irregularities. Perform detailing before or after product installation.

B. Install product and accessories in details as directed in manufacturer's literature.

C. Sheathing joints, use any of the following methods:
1. 4 inch detail flashing centered over joint.
2. 4 inch reinforcing fabric imbedded in product and centered over joint.
3. Paintable sealant or fill compound, tooled as shown in details.

D. Sheathing inside and outside corners. Flashing or reinforcement shall bear 3 inches minimum onto either side of angle change. Use any of the following methods:
1. Minimum 9 inch detail flashing centered over angle change
2. 12 inch reinforcing fabric centered over angle change and imbedded in product
3. 12 inch glass mat centered over angle change and imbedded in product

E. Window openings. Flashing or reinforcement shall bear onto wall 3 inches minimum and shall return into window opening according to Project drawings. Use any of the following methods:
1. Detail flashing
2. Glass mat imbedded in product

F. Pipe or duct penetrations. Flashing or reinforcement shall bear onto wall 3 inches minimum and shall bear onto pipe or duct 3 inches, or according to Project drawings. Select any:
1. Detail flashing
2. Glass mat imbedded in product

G. Expansion or deflection joints. Flashing shall bear 3 inches minimum onto either side of joint. Select any:
1. Detail flashing bellows or expansion bulb

2. Transition membrane expansion bulb

H. Interface of dissimilar substrates: Flashing or reinforcement shall bear 3 inches minimum onto either side of joint. Select any:
1. Minimum 9 inch detail flashing
2. 12 inch reinforcing fabric imbedded in product
3. 12 inch glass mat imbedded in product

3.4 INSTALLATION

A. Apply product over opaque wall surfaces as indicated in Project drawings.

B. Spray or roller-apply product to achieve specified thickness in accordance with manufacturer's literature.

3.5 SCHEDULE

A. Wall substrates and roof or temporary roof shall be in place, effectively enclosing interior space, before proceeding with air barrier installation.

B. Seal penetrations made through installed product according to manufacturer's instructions and drawings.

C. Seal fenestration to product with detail membrane, transition membrane, polyurethane sealant, silicone sealant or polyurethane foam sealant according to Project drawings

D. Through-wall flashing may be installed before or after product. Seal termination of metal through-wall flashing to product with 6 inch width counter-flashing strip consisting of any of these:
1. Detail flashing
2. Reinforcing fabric imbedded in product
3. Glass mat imbedded in product

E. Cladding shall be installed after product.

F. Rigid or semi-rigid insulation installed over product shall be attached with insulation adhesive and mechanical fastening according to insulation manufacturer and air barrier manufacturer's instructions.

G. Sequence Work to enable air barrier continuity at wall-to-foundation, shelf angle, wall-to-roof, fenestration, different wall assemblies and other conditions providing challenges to air barrier continuity.

3.6 REPAIR AND PROTECTION

A. Protect from damage during application and remainder of construction period.

B. Inspect before covering. Repair or replace damaged material according to

manufacturer's literature.

C. Product and accessories are not designed for permanent exposure. Cover with insulation or exterior cladding as soon as schedule allows.

D. Outdoor exposure of installed product and accessories shall not exceed air manufacturer's published limit.

3.7 WASTE MANAGEMENT

A. Coordinate with Section 01 74 23.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 07 27 26

SECTION 074213.23 - METAL COMPOSITE MATERIAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes metal composite material wall panels, at east stair wall cladding.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal composite material panel Installer, metal composite material panel manufacturer's representative, structural-support Installer, and installers whose work interfaces with or affects metal composite material panels, including installers of doors, windows, and louvers.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal composite material panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review flashings, special siding details, wall penetrations, openings, and condition of other construction that affect metal composite material panels.
6. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.
7. Review temporary protection requirements for metal composite material panel assembly during and after installation.
8. Review procedures for repair of panels damaged after installation.
9. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal composite material panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
2. Accessories: Include details of the flashing, trim and anchorage, at a scale of not less than 1-1/2 inches per 12 inches (1:10).

C. Samples for Initial Selection: For each type of metal composite material panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Composite Material Panels: 12 inches (305 mm) long by actual panel width. Include fasteners, closures, and other metal composite material panel accessories.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each product, tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal composite material panels to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical metal composite material panel assembly as shown on Drawings, including corner, supports, attachments, and accessories, approximately 48” in length by full thickness.
2. Water-Spray Test: Conduct water-spray test of mockup of metal composite material panel assembly, testing for water penetration according to AAMA 501.2.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal composite material panels, and other manufactured items so as not to be damaged or deformed. Package metal composite material panels for protection during transportation and handling.

B. Unload, store, and erect metal composite material panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal composite material panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal composite material panels to ensure dryness, with positive slope for drainage of water. Do not store metal composite material panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal composite material panels during installation.

1.9 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal composite material panels to be performed according to manufacturers' written instructions and warranty requirements.

1.10 COORDINATION

A. Coordinate metal composite material panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal composite material panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: 5 years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal composite material panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide metal composite material panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 330:

1. Wind Loads: As indicated on Drawings
2. Other Design Loads: as indicated on Drawings
3. Deflection Limits: For wind loads, no greater than 1/240 of the span.

B. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 283 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq. ft. (75 Pa).

C. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 331 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft. (300 Pa).

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 METAL COMPOSITE MATERIAL WALL PANELS

A. Metal Composite Material Wall Panel Systems: Provide factory-formed and -assembled, metal composite material wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment assembly components, panel stiffeners, and accessories required for weathertight system.

a. Basis-of-Design Product: Subject to compliance with requirements, provide an ACM composite panel - 3A Composites USA, Inc.; as manufactured by Alucobond Plus,.or comparable product by one of the following, or approved equal:
b. Formabond Wall System as manufactured by CENTRIA Architectural Systems

c. Alcoa Inc.; Reynobond FR.

B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch- (0.50-mm-) thick, coil-coated aluminum sheet facings.

1. Panel Thickness: 0.236 inch (6 mm) As indicated on Drawings.
2. Core: Fire retardant.
3. Exterior Finish: Three-coat fluoropolymer.

a. Color: As selected by Architect from manufacturer's full range.

C. Attachment Assembly Components: Formed from extruded aluminum.

D. Attachment Assembly: Manufacturer's standard extrusions with integral weather stipping, panel stiffeners, panel clips and anchor channels.

2.3 MISCELLANEOUS MATERIALS

A. Miscellaneous Metal Subframing and Furring: ASTM C 645, cold-formed, metallic-coated steel sheet ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) aluminum-zinc-alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal composite material panel system.

B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal composite material panels unless otherwise indicated.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal composite material panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, rakes, fasciae, parapet caps, soffits, reveals, and fillers. Finish flashing and trim with same finish system as adjacent metal composite material panels.

D. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal composite material panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

E. Panel Sealants: ASTM C 920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal composite material panels and remain weathertight; and as recommended in writing by metal composite material panel manufacturer.

2.4 FABRICATION

A. General: Fabricate and finish metal composite material panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Fabricate metal composite material panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.
2. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
3. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.
4. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.
6. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

    a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal wall panel manufacturer for application but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Aluminum Panels and Accessories:
1. Three-Coat Fluoropolymer: AAMA 620. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, metal composite material panel supports, and other conditions affecting performance of the Work.

1. Examine wall framing to verify that girts, angles, channels, studs, and other structural panel support members and anchorage have been installed within alignment tolerances required by metal composite material wall panel manufacturer.
2. Examine wall sheathing to verify that sheathing joints are supported by framing or blocking and that installation is within flatness tolerances required by metal composite material wall panel manufacturer.

   a. Verify that air- or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and assemblies penetrating metal composite material panels to verify actual locations of penetrations relative to seam locations of metal composite material panels before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal composite material panel manufacturer's written recommendations.

3.3 METAL COMPOSITE MATERIAL PANEL INSTALLATION

A. General: Install metal composite material panels according to manufacturer's written instructions in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to supports unless otherwise indicated. Anchor metal composite material panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Shim or otherwise plumb substrates receiving metal composite material panels.
2. Flash and seal metal composite material panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air- or water-resistive barriers and flashings that will be concealed by metal composite material panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Install flashing and trim as metal composite material panel work proceeds.
6. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.
7. Align bottoms of metal composite material panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.

8. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Aluminum Panels: Use stainless-steel fasteners.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal composite material panel manufacturer.

D. Attachment Assembly, General: Install attachment assembly required to support metal composite material wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.

1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.

E. Clip Installation: Attach panel clips to supports at locations, spacings, and with fasteners recommended by manufacturer. Attach routed-and-returned flanges of wall panels to panel clips with manufacturer's standard fasteners.

1. Seal horizontal and vertical joints between adjacent panels with sealant backing and sealant. Install sealant backing and sealant according to requirements specified in Section 079200 "Joint Sealants."
2. Seal horizontal and vertical joints between adjacent metal composite material wall panels with manufacturer's standard gaskets.

F. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal composite material panel assembly including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal composite material panel manufacturer; or, if not indicated, provide types recommended in writing by metal composite material panel manufacturer.

G. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.

1. Install exposed flashing and trim that is without buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof performance.
2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet (3 m) with no joints allowed within 24 inches (605 mm) of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with mastic sealant (concealed within joints).

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal composite material wall panel units within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m), non-accumulative, on level, plumb, and location lines as indicated, and within 1/8-inch (3-mm) offset of adjoining faces and of alignment of matching profiles.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified independent testing agency to perform field tests and inspections.

B. Water-Spray Test: After installation, test area of assembly shown on Drawings for water penetration according to AAMA 501.2.

C. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect completed metal composite material wall panel installation, including accessories.

D. Metal composite material wall panels will be considered defective if they do not pass test and inspections.

E. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

F. Prepare test and inspection reports.

3.6 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal composite material panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal composite material panel installation, clean finished surfaces as recommended by metal composite material panel manufacturer. Maintain in a clean condition during construction.

B. After metal composite material panel installation, clear weep holes and drainage channels of obstructions, dirt, and sealant.

C. Replace metal composite material panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074213.23

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SECTION 07 54 23 – THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Adhered thermoplastic polyolefin (TPO) roofing system on metal deck, including:
2. Roof insulation.
3. Roof insulation cover board.
4. Walkway material.

B. Related Sections:

1. Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, wood cants, curbs, and blocking.
2. Division 07 Section "Preparation for Re-Roofing" for recover board beneath new membrane roofing.
3. Division 07 Section "Sheet Metal Flashing and Trim" for shop-formed sheet metal items including roof drainage system items, roof penetration flashings, base and counterflashings and reglets.
4. Division 07 Section "Roof Specialties" for manufactured copings, roof edge flashings and counterflashings, and roof edge drainage systems.

1.2 DEFINITIONS

A. Roofing Terminology: Refer to ASTM D1079 "Standard Terminology Relating to Roofing and Waterproofing" and glossary in applicable edition of NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" for definition of terms related to roofing work in this Section.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review drawings and specifications.
3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
5. Examine substrate conditions and finishes for compliance with requirements, including flatness and fastening.
6. Review structural loading limitations of roof deck during and after roofing.

7. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
8. Review governing regulations and requirements for insurance and certificates if applicable.
9. Review temporary protection requirements for roofing system during and after installation.
10. Review roof observation and repair procedures after roofing installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes and crickets.
3. Roof plan showing types and orientation of roof deck and orientation of membrane roofing and fastening spacings and patterns for mechanically fastened membrane roofing if applicable.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Samples for Verification: For the following products:

1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
2. Walkway pads or rolls.

D. Samples Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.5 INFORMATIONAL SUBMITTALS

A. Contractor's Product Certificate: Submit certificate, indicating products intended for Work of this Section, including product names and numbers and manufacturers' names, with statement indicating that products to be provided meet the requirements of the Contract Documents.

B. Qualification Data: For Installer, Manufacturer and Roofing Inspector.

1. Include letter from Manufacturer written for this Project indicating approval of Installer.

C. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.

a. Include: UL listing certificate.

2. Product Compatibility: Indicate manufacturer has verified compatibility of roofing system components, including but not limited to: Roofing membrane, flashing sheets, adhesives, and sealants.

D. Warranties: Unexecuted sample copies of special warranties.

E. Inspection Reports: Reports of Roofing Inspector. Include weather conditions, description of work performed, tests performed, defective work observed, and corrective actions taken to correct defective work.

1.6 CLOSEOUT SUBMITTALS

A. Executed copies of warranties.

B. Maintenance Data: To include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and certified by manufacturer, including a full-time on-site supervisor with a minimum of five years' experience installing products comparable to those specified, able to communicate verbally with Contractor, Architect, and employees, and qualified by the manufacturer to install manufacturer's product and furnish warranty of type specified.

B. Manufacturer Qualifications: Approved manufacturer listed in this Section, UL listed for roofing systems comparable to that specified for this Project, with minimum five years' experience in manufacture of thermoplastic roof membrane products in successful use in similar applications.

1. Approval of Comparable Products: Submit the following in accordance with project substitution requirements, within time allowed for substitution review:

    a. Product data, including certified independent test data indicating compliance with requirements.

    b. Samples of each component.

    c. Sample submittal from similar project.

    d. Project references: Minimum of five installations of specified products not less than five years old, with Owner and Architect contact information.

    e. Sample warranty.

2. Substitutions following award of contract are not allowed except as stipulated in Division 01 General Requirements.
3. Approved manufacturers must meet separate requirements of Submittals Article.

C. Roofing Inspector Qualifications: A technical representative of manufacturer not engaged in the sale of products and experienced in the installation and maintenance of the specified roofing system, qualified to perform roofing observation and inspection specified in Field Quality Control Article, to determine Installer's compliance with the requirements of this Project, and approved by the manufacturer to issue warranty certification. The Roofing Inspector shall be one of the following:

1. An authorized full-time technical employee of the manufacturer.
2. An independent party certified as a Registered Roof Observer by the International Institute of Building Enclosure Consultants (formerly the Roof Consultants Institute) retained by the Contractor or the Manufacturer and approved by the Manufacturer

D. Manufacturer's Installation Instructions: Obtain and maintain on-site access to manufacturer's written recommendations and instructions for installation of products.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.9 PROJECT / FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

B. Daily Protection: Coordinate installation of roofing so insulation and other components of roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work to cover exposed roofing and insulation with a course of roofing sheet securely in place with joints and edges sealed.
2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing.
3. Remove temporary plugs from roof drains at end of each day.
4. Remove and discard temporary seals before beginning work on adjoining roofing.

1.10 WARRANTY

A. Manufacturer's Warranty: Roof System Manufacturer's standard form in which Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within warranty period, as follows.

1. Form of Warranty: Manufacturer's standard warranty form.
2. Scope of Warranty: Work of this Section and including sheet metal details and termination details installed by the roof system Installer and approved by the Roof System Manufacturer.
3. Warranty Period: 20 years from date of completion.

B. Manufacturer Inspection Services: By manufacturer's technical representative, to report maintenance responsibilities to Owner necessary for preservation of Owner's warranty rights. The cost of manufacturer's inspections is included in the Contract Sum.

1. Inspections to occur in following years: 2, 5, 10 and 15 following completion.

C. Installer Warranty: Installer's warranty signed by Installer, as follows.

1. Form of Warranty: Form included in Project Manual.
2. Scope of Warranty: Work of this Section.
3. Warranty Period: 2 years from date of completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: The roof system specified in this Section is based upon products of Tremco CPG Inc, Beachwood, OH, (800) 562-2728, www.tremcoroofing.com that are named in other Part 2 articles. Provide specified products or comparable products of one of the following.

1. Tremco CPG Inc., Basis-of-Design.
2. Manufacturers of comparable products: Approved by Architect prior to bid.

B. Source Limitations: Obtain components for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

1. Accelerated Weathering: Roofing system shall withstand 10,000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746/D3746M, ASTM D4272/D4272M, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.

B. Roofing System Design: Provide membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency in accordance with ANSI/FM 4474, UL 580, or UL 1897, and to resist uplift pressures calculated in accordance with ASCE-7 and applicable code.

1. All Zones (Corner, Perimeter, and Field-of-Roof) Uplift Pressures: As indicated on Drawings.

C. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to

defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

1. Accelerated Weathering: Roofing system shall withstand 10,000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.

D. Flashings and Fastening: Comply with requirements of Division 07 Sections “Sheet Metal Flashing and Trim” and “Roof Specialties.” Provide base flashings, perimeter flashings, detail flashings and component materials and installation techniques that comply with requirements and recommendations of the following:

1. FM Global 1-49: Loss Prevention Data Sheet for Perimeter Flashings.
2. FM Global 1-29: Loss Prevention Data Sheet for Above Deck Roof Components.
3. NRCA Roofing Manual (Sixth Edition) for construction details and recommendations.
4. SMACNA Architectural Sheet Metal Manual (Seventh Edition) for construction details.
5. Comply with requirements of Division 07 Section "Sheet Metal Flashing and Trim" and "Roof Specialties".

E. Exterior Fire-Test Exposure: ASTM E108 or UL 790 Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

2.3 MATERIALS, GENERAL

A. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

B. FM Global Standards: Roofing, base flashings, and component materials shall be identical to materials that comply with requirements in FM Global 4470 as part of a roofing system listed or approved by FM Global. Identify applicable materials with FM Global markings.

2.4 THERMOPLASTIC MEMBRANE MATERIALS

A. TPO Roof Membrane:

1. Thermoplastic Polyolefin (TPO) Sheet: Internal fabric reinforced, ASTM D6878.

a. Basis of design product: Tremco, TremPly TPO Single Ply Roof Membrane.

b. Breaking Strength, at 45 mils, ASTM D751: 280 lbf/in (50 kN/m) by 270 lbf/in (47 kN/m) .

c. Tear Strength, ASTM D751: 124 lbf (0.55 kN) by 140 lbf (0.62 kN).

d. Elongation at Break, ASTMD751: 30 percent.

e. Membrane Thickness, nominal: 80 mils (2.0 mm).

f. Exposed Face Color: Grey.

B. Sheet Flashing: Manufacturer's standard, smooth-backed, sheet flashing of same material, type, reinforcement, thickness, and color as TPO sheet membrane.

2.5 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.

1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.

B. Membrane Bonding Adhesive:

1. Contact-type adhesive, low odor, VOC-compliant, for bonding TPO single ply membranes and flashings to substrates.

a. Basis of design product: Tremco, TremPly TPO Single Ply Roof Membrane.

b. Breaking Strength, at 45 mils, ASTM D751: 280 lbf/in (50 kN/m) by 270 lbf/in (47 kN/m) .

C. Flashing Membrane Adhesive: Same as membrane bonding adhesive.

D. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch (25 mm by 3 mm) thick; with anchors.

E. Metal Battens: Manufacturer's standard, aluminum-zinc-alloy-coated or zinc-coated steel sheet, approximately 1 inch wide by 0.05 inch (25 mm wide by 1.3 mm) thick, prepunched.

F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening components to substrate, and acceptable to membrane roofing system manufacturer.

G. Joint Sealant: Elastomeric joint sealant compatible with roofing materials, with movement capability appropriate for application.

1. Joint Sealant, Silicone: ASTM C920 Type S, Grade NS, Class 25, Use NT, M, G, A, and O. Single-component low-modulus moisture curing self-leveling sealant, formulated for compatibility and use with specified substrates.

a. Basis of design product: Tremco, Tremseal S.

b. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 0 g/L.

c. Tensile Strength at maximum elongation, ASTM D412: 200 psi (1379 kPa).

d. Tear Resistance, ASTM D624: 40 pli (7 kN/m).

e. Peel Strength onlisted substrates, ASTM C794: 30 pli (5 kN/m).

f. Hardness, Shore A, ASTM C611: 15.

g. Color: Aluminum/Stone.

H. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.6 ROOF INSULATION MATERIALS

A. General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from insulation manufacturer's standard sizes, suitable for application, and of thicknesses indicated.

1. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated, not less than two times the roof slope.

B. Roof Insulation: Provide roof insulation product in thicknesses indicated in Part 3 as follows:

1. Board Insulation, Polyisocyanurate: CFC- and HCFC- free, with recycled content glass-fiber mat facer on both major surfaces, ASTM C1289 Type II Class 1.

a. Compressive Strength, ASTM D1621: Grade 2: 20 psi (138 kPa).

2.7 ROOF INSULATION ACCESSORIES

A. Cover Board:

1. Gypsum panel, cellulosic fiber reinforced, water-resistant, ASTM C1278/C1278M.

a. Basis of design product: USG Securock Gypsum Fiber Roof Board.

b. Thickness: 1/2 inch (13 mm).

B. Roof Insulation Adhesive:

1. Urethane adhesive, bead-applied, low-rise two-component solvent-free low odor, formulated to adhere roof insulation to substrate.

a. Basis of design product: Tremco, Low Rise Foam Insulation Adhesive.

b. Flame Spread Index, ASTM E84: 10.

c. Smoke Developed Index, ASTM E84: 30.

d. Volatile Organic Compounds (VOC), maximum, ASTM D3960: 0 g/L.

e. Tensile Strength, minimum, ASTM D412: 250 psi (1720 kPa).

f. Peel Adhesion, minimum, ASTM D903: 17 lbf/in (2.50 kN/m).

g. Flexibility, 70 deg. F (39 deg. C), ASTM D816: Pass.

C. Tapered Edge Strips: ASTM C208, Type II, Grade 1, cellulosic-fiber insulation board.

D. Insulation Fasteners: Factory-coated #14 H.D. steel fasteners and 3-inch metal plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.

2.8 WALKWAY MATERIALS

A. Walkway Material:

1. Walkway roll, reinforced TPO membrane roll with serrated slip-resistant surface fabricated for heat welding to compatible TPO membrane surface.
2.

a. Basis of design product: Tremco, TremPly TPO Walkway Roll.

b. Roll Width: 34 inches x 50 ft (864 mm x 15.24m).

c. Thickness: 0.125 inch (3.1 mm).

d. Color: Gray.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
2. Steel Roof Deck:

a. Verify that deck is securely fastened and properly supported with no projecting fasteners and with no adjacent units in excess of 1/16 inch (1.6 mm) out of plane relative to adjoining deck.

3. Verify that existing substrate is sound and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.3 INSTALLATION, GENERAL

A. Install roofing system in accordance with manufacturer’s written instructions and approved details.

B. Install wood blocking, curbs, and nailers in accordance with requirements of Division 06 Section "Miscellaneous Rough Carpentry."

C. NRCA Installation Details: Install roofing system in accordance with applicable NRCA Manual Plates and NRCA recommendations; modify as required to comply with manufacturer's approved details and perimeter fastening requirements of FM Global references if applicable.

3.4 INSULATION INSTALLATION

A. Install lightweight insulating concrete in accordance with requirements of Division 03 Section “Lightweight Insulating Concrete.”

B. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.

C. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.

D. Tapered Insulation and Crickets: Install tapered insulation under area of roofing to conform to slopes indicated.

1. Where crickets are indicated or required to provide positive slope to drain, make slope of crickets minimum of two times the roof slope.

E. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches (70 mm) or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

1. Flat Insulation System on Sloped Roof Deck: Install insulation at minimum thickness as follows:

a. Minimum Continuous Insulation R-value: Not less than R-30.

2. Insulation Drain Sumps: Tapered insulation sumps, not less than 2 by 2 ft. (600 by 600 mm), sloped to roof drain; sump to maximum depth of not more than 1 inch (25 mm) less than the Project-stipulated continuous insulation thickness based upon code requirements.

F. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.

G. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with insulation.

1. Cut and fit insulation within 1/4 inch (6 mm) of nailers, projections, and penetrations.

H. Mechanically Fastened Insulation: Install each layer of insulation and secure to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten insulation at a rate of one fastener and plate per every 12-inches, to resist uplift pressure at corners, perimeter, and field of roof.

I. Cover Boards: Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches (150 mm) in each direction. Loosely butt cover boards together.

1. Adhere cover boards by setting in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining cover board in place.

3.5 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.

B. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align membrane roofing, maintain uniform side, and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Solvent-Based Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow adhesive to become tacky before installing membrane roofing; do not allow adhesive to fully dry. Roll membrane into adhesive. Do not apply adhesive to splice area of membrane.

E. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.

F. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

G. Welded Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.

H. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.

3.6 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Seal top termination of base flashing with a metal termination bar and a continuous bead of joint sealant.

3.7 WALKWAY INSTALLATION

A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

A. Roofing Inspector: Owner will engage a qualified roofing inspector to perform roof tests and inspections and to prepare test reports.

B. Infrared Moisture Surveys: Provide infrared scan moisture survey to ensure insulation in roof assembly remains dry, at the following minimum intervals:

1. At end of roof installation, before the Manufacturer’s warranty is issued.
2. Before the end of Contractor’s 2-year warranty.
3. Provide copies of the infrared reports to the Architect and Manufacturer within 10 day of completion of surveys.
4. Contractor to remove any insulation indicated as wet, install new dry insulation and repair roof to as-new condition meeting Manufacturer’s approval.

C. Roofing Inspector: Contractor shall engage a qualified roofing inspector for a minimum of once per week on site to perform roof tests and inspections and to prepare start up, interim and final reports. Roofing Inspector's quality assurance inspections shall comply with applicable criteria established in NRCA's "Quality Control and Quality-assurance Guidelines for the Application of Membrane Roofing Systems."

D. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.

E. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

F. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.9 PROTECTING AND CLEANING

A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 73 54 23

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SECTION 07 62 00 - SHEET METAL FLASHINGS & SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section consists of the provision of all plant, labor, materials, equipment, testing and services necessary to complete the work of Sheet Metal Flashings & Specialties, shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Sheet metal work that is compatible with the roofing systems specified, including cap and through wall flashings, hook strips, fascia, gravel stops, copings, gutters, leaders, valleys, flat and standing seam panels, ridges and miscellaneous flashings.

B. Related Requirements

1. Rough Carpentry - Section 06 10 00
2. TPO Roofing - Section 07 54 23
3. Roof Accessories - Section 07 72 00

1.2 CODE APPROVAL REQUIREMENTS

A. Fabricate and install roof perimeter flashings that comply with the NY State Uniform Fire Prevention and Building Code and ANSI/SPRI ES-1 requirements.

1.3 QUALITY ASSURANCE

A. Installer Qualifications:

1. A firm (Installer) with not less than 5 continuous years experience performing Sheet Metal work similar to that required for this project, employing personnel skilled in the specified work.

   a. The Installer shall directly employ the personnel performing the work of this section.
   b. The Installer shall have a full time supervisor/foreman on the roof when work is in progress. The Supervisor shall have a minimum of 5 years experience in work similar in nature and scope to this project, and speak fluent English.

2. The Installer shall provide a reference list of at least three projects of comparable size and similar design, within a fifty mile radius of this project, which may be observed by representatives of the Owner:

   a. The reference list shall include at a minimum, the completion date, a description of the work performed, the Owner's name - contact person - phone number and address and the Architect's name - contact person and phone number.
   b. The Installer shall provide the reference list prior to contract award if requested.

B. Material Quality:

1. Obtain each product from a single Manufacturer which has manufactured the same product in the United States of America for not less than 5 continuous years.
2. Obtain copper and pre-finished sheet metal items from the same mill run to maintain consistent color hue and surface finish.

C. Pre-Work Conference: Meet at the project site approximately one week prior to starting work, with the Architect, Owner and other representatives concerned about the work, to discuss the following:

1. How the existing building will be kept watertight as work progresses.
2. How sheet metal work will be coordinated with the installation of the vapor barrier, thermal barrier, insulation, cover board, roofing, flashings, roof accessories and other items to provide a watertight installation.
3. Generally accepted industry practice, the Manufacturer's instructions for handling and installing his products, and specified work requirements.
4. The condition of the substrate (deck), curbs, penetrations and other preparatory work needed.
5. Submittals, both completed and yet to be completed.
6. The construction schedule, forecast weather, availability of materials, personnel, equipment and facilities needed to proceed and complete the work on schedule.
7. A schedule for Manufacturer and Architect inspections.

1.4 SUBMITTALS

A. Submit the following items far enough in advance to obtain approval prior to performing any work:

1. Pre-work site and existing building inspection report with photos to document conditions before work starts.
2. Shop drawings, or 2 foot long samples, for each sheet metal item, to show how it relates and fits on adjoining masonry and wood blocking assemblies, and with the roof, stripping, and flashings.
3. A 6 inch square piece of each type of sheet metal to show surface finish, texture and color.
4. Literature for each type of sheet metal, sealant and fastener, including the Manufacturer's instructions which show how to install the items, and form and seal joints.
5. A sample of the Contractor’s guarantee form.

B. Technical submittals shall be prepared and made by the firm that will perform the actual work.

C. Payment requisitions will not be processed until all submittals are received and approved.

1.5 JOB MOCK-UPS

A. After the submittals are approved, prepare in actual job locations, mock-ups of cap and through wall flashings, hook strips, drip edges, fascia, gravel stops, and all other items of sheet metal and related work, for inspection and approval by the Architect.

B. Construct each mock-up of two full lengths of metal, fastened, connected and stripped-in to the related roofing system, to show the following:

1. Type, gauge, color, cross-sectional dimensions and shape, and joint and mitering techniques.
2. Related masonry work, wood blocking, and the attachment techniques and fasteners for all wood and metal components.
3. Other sheet metal related materials and their installation techniques to fully define the detailing of each mock-up.

C. The purpose of each mock-up is to establish the minimum standard of materials and workmanship, and to assure that completed work which matches the mock-ups will be fully functional and serve the purpose for it has been designed.

D. Approved mock-ups may be left in place and incorporated into the permanent installation. Rejected mock-ups shall be removed and replaced until approved.
E. Do not purchase or fabricate sheet metal items until mock-up installation, inspection and approval are completed and approval is documented in writing.

1.6 GUARANTEE

A. Provide a Contractor's written Guarantee which warrants that all work will remain free of material and workmanship defects and in a watertight condition for a five year period beginning upon Final Completion:

1. Defective work includes but is not limited to the following types of failure: leakage, adhesive separation, delamination, lifting, loosening, splitting, cracking, and undue expansion.
2. The Contractor's Guarantee shall provide that the Contractor will make the repairs and modifications necessary to enable the work to perform as warranted at his own expense.
3. The Guarantee shall include the removal and replacement of items or materials installed as part of the original work, if removal is needed to affect guaranteed repairs.

B. The Guarantee shall be issued no more than 30 days before the satisfactory completion of punch list work.

C. The Contractor’s Surety Company may add a rider to the Performance Bond which clarifies that Bond Coverage expires two years after Final Completion; i.e., Performance Bond Coverage does not run for the entire five year term of the Contractor’s Guarantee.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Copper sheet: ASTM B370, 99.0 % pure copper, thickness 16 ounces per square foot. Use copper for all metal items not otherwise indicated

B. Zinc-Tin coated copper: copper sheet, coated on both sides, with a smooth uniform coating of zinc and tin, base metal weight 16 ounces per square foot, cold rolled temper, available as FreedomGray Copper by Revere.

C. Solder:

1. 50-50 tin and lead for plain copper, supplied in one pound bars with the alloy mixture stamped into the bar by the Manufacturer.
2. Lead free / or pure tin solder for zinc-tin coated copper, Number 497 by Johnson Manufacturing.

D. Flux:

1. Water-Soluble Liquid Flux, Kester #3345 for iron soldering of brass and copper.
2. Tin-bearing flux such as “Flux-N-Solder E127 with pure tin” by Johnson Manufacturing.

E. Factory Fabricated Roof Edge System: Extruded aluminum anchor bars secured with #9 stainless steel screws spaced 12 inches on center and .050 inch thick Kynar 500 prefinished aluminum trim covers, independently tested to comply with the ANSI / SPRI ES-1 Wind Design Guide.

F. Fasteners: stainless steel, or to match the sheet metal being fastened.

G. Glass Cloth: open mesh glass fabric coated on each side with plasticized asphalt as manufactured by Karnak Corporation or equal.

H. Asphalt cement: Federal Specification SS-C-153B, Type 1, asbestos free grade.

I. Exterior mounted leaders and straps: .027 inch thick rectangular corrugated aluminum leaders factory finished with baked acrylic enamel. Fasten each leader with 1/16 inch thick by 1 inch wide straps spaced 7 feet on center.

J. Sealant: High performance, solvent free, formulated and moisture curing silyl-terminated polyether sealant, ASTM C-920, Type S, Grade NS, Class 25, NovaLink construction sealant by ChemLink, color as selected.

PART 3 - EXECUTION

3.1 GENERAL

A. Accurately reproduce the details and design shown, and form profiles, bends and intersections, sharp, true and even. Fabricate sheet metal in the shop whenever possible, and form joints, laps, splices and connections to shed water and condensation in the direction of flow.

B. Provide any miscellaneous flashing and sheet metal work not shown on the drawings but otherwise needed to leave the project complete and entirely watertight, neatly and carefully executed in a thorough and workmanlike manner.

3.2 INSPECTION

A. Examine surfaces to receive work of this section and report any defects to the Owner and Architect.

3.3 INSTALLATION

A. Fabricate and install copper work in accordance with the current edition of "Copper and Common Sense" as published by the Revere Copper and Brass Company, unless otherwise indicated.

1. Form all joints, except loose locked sealant filled expansion joints, to overlap 2 inches.
2. Secure the joints with rivets spaced 1 inch on center positioned about 1/2 inch from the top edge of the joint, then sweat solder the joint.
3. Use solder only to fill and seal the joint, not for mechanical strength. Form soldered joints continuous, strong and free from defects, with well heated soldering irons. Do not use open flame torches for soldering.
4. Clean soldered joints daily, immediately after soldering, by washing them with soap and water applied with a soft bristle brush, then rinsing with clear water.

B. Securely fasten and anchor all work, and make provisions for thermal expansion. Submit details of expansion joints for approval. Install fasteners through one edge of metal only, use a hook strip on the other edge.

C. Use stainless steel pin Zamac type nail-in fasteners, or stainless steel screws and washers with neoprene inserts where fasteners will be exposed.

3.4 CAP FLASHINGS

A. Install new copper cap flashings built into masonry walls properly joined to all related materials in a watertight manner.

1. Solder all joints in the new cap flashing, except form 2 inch wide flat locked sealant filled expansion joints a maximum of 32 feet on center.
2. Form the flashing to turn up 2 inches inside the wall and finish with a hem on the bottom exposed edge.
3. Fasten the top edge of the cap flashing to the back up masonry 12 inches on center.
4. Install the new cap flashing under flexible type wall flashings where possible. Where it is not possible to lap the new cap flashing under an existing wall flashing, install a ply of glass cloth set in and coated with asphalt cement to connect the new cap flashing to the existing wall flashing.
5. In the absence of an existing wall flashing, or at a solid masonry wall, turn up the new cap flashing 2 inches behind the first wythe of masonry.
6. Install new cap flashings where shown on the drawings, and at a height of 10 to 12 inches above the roof surface.

B. Install new aluminum cap flashings on existing and new skylight and equipment curbs.

1. Form the cap flashing to extend 2 inches under the equipment or skylight, 4 inches over the base flashing, and finish with a 1/2 inch hem on the bottom edge.
2. Install a 1/2 inch thick by 2 inch wide continuous foam gasket between the cap flashing and mechanical equipment or skylight. Do not set the equipment or skylight in sealant.
3. Secure the equipment or skylight to the curb with stainless steel screws spaced 12 inches on center.

3.5 DRIP EDGES

A. Fabricate drip edges to extend 1-1/2 inches past the roof edge, and turn down to ensure water cannot track back and run down the fascia. Secure the drip edge with roofing nails along the top edge, spaced 4 inches apart along the raw metal edge. Form joints in the drip edge with 6 inch wide concealed under plates which duplicate the profile of the drip edge. Set the underplates in a full bed of sealant.

3.6 HOOK STRIPS

A. Form continuous hook strips with locks that engage the superimposed trim piece a minimum of 3/4 inch, and to cover the entire underside edge of the wood blocking and neatly extend to the building wall.

B. Fasten hook strips along their bottom edge, just above the 45 degree bend, with nails spaced 4 inches on center into underlying wood blocking; Zamac type nail-in type fasteners spaced 8 inches on center into masonry surfaces, or screws spaced 8 inches on-center into sheet metal surfaces.

3.7 ROOF EDGE SYSTEM

A. Install a factory fabricated roof edge system on all roof eaves.

1. Extend the EPDM roof down the face of the fascia trim, so it stops just short of the bottom edge of the anchor bar.
2. Install the anchor bar straight, level and true, set in a full bed of sealant, and secure the bar with #9 by 2 inch long stainless steel screws spaced no more than 12 inches apart.
3. Pre-drill screw holes in the underlying metal fascia trim, and where extra fasteners are needed at corners and special conditions.

4. Install color matching under plates at each joint in the roof edge trim; set the under plates in a full bed of sealant.

3.8 CLEANING, PROTECTION AND WATERTIGHTNESS

A. Conduct an inspection of the interior and exterior of the building and grounds, and submit a written report with photos to document any pre-existing leakage or damage, prior to performing any work.

B. The Owner will conduct a similar inspection at the completion of the work, and the Contractor will be charged for all leakage or damage which was not documented in the Contractor's report, or repaired to the Owners satisfaction at the Contractor's expense.

C. Provide any equipment, material and labor necessary to protect the site, the building, its contents and occupants, pedestrians, and surrounding landscaped and paved areas from damage due to the construction work or from inclement weather during construction.

D. Do not perform work during inclement weather. Protect incomplete work and the building from damage by inclement weather which may occur unexpectedly. Make all work areas watertight at the end of each day's work.

E. Frequently clean up all refuse, rubbish, scrap materials and debris so the work site presents a neat, orderly and workmanlike appearance.

F. Carefully clean the roof to remove all residual debris when work is complete. After cleaning the roof, thoroughly clean all drain sumps, drain lines, leader heads and leaders. Do not allow debris to enter the drainage system.

3.9 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with the Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing until removed from the site.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 07 62 00

SECTION 07 72 00 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The Work of this Section consists of the provision of all plant, labor, materials, equipment, testing and services necessary to complete the work for roof accessories as shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Equipment supports.

2. Preformed flashing sleeves.

B. Related Sections:
1. Division 07: "Sheet Metal Flashing and Trim" for shop- and field-formed metal flashing, roof-drainage systems, roof expansion-joint covers, and miscellaneous sheet metal trim and accessories.
2. Division 23: "HVAC Power Ventilators" for power roof-mounted ventilators.

1.3 PERFORMANCE REQUIREMENTS

A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof accessories. Include plans, elevations, keyed details, and attachments to other work. Indicate dimensions, loadings, calculations and special conditions. Distinguish between plant- and field-assembled work.

C. Samples: For each exposed product and for each color and texture specified, prepared on Samples of size to adequately show color.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Roof plans, drawn to scale, and coordinating penetrations and roof-mounted items. Show the following:

1. Size and location of roof accessories specified in this Section.
2. Method of attaching roof accessories to roof or building structure.
3. Other roof-mounted items including mechanical and electrical equipment, ductwork, piping, and conduit.
4. Required clearances.

B. Warranty: Sample of special warranty.

C. Documentation that installers are approved by manufactures.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof accessories to include in operation and maintenance manuals.

1.7 COORDINATION

A. Coordinate layout and installation of roof accessories with roofing membrane and base flashing and interfacing and adjoining construction to provide a leakproof, weathertight, secure, and noncorrosive installation.

B. Coordinate dimensions with rough-in information or Shop Drawings of equipment to be supported.

PART 2 - PRODUCTS

2.1 METAL MATERIALS

A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation and mill phosphatized for field painting where indicated.

1. Mill-Phosphatized Finish: Manufacturer's standard for field painting.
2. Baked-Enamel or Powder-Coat Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil (0.025 mm) for topcoat. Comply with coating manufacturer's written instructions for applying and baking to achieve a minimum dry film thickness of 2 mils (0.05 mm).
3. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester-backer finish consisting of prime coat and wash coat, with a minimum total dry film thickness of 0.5 mil (0.013 mm).

B. Aluminum Sheet: ASTM B 209, manufacturer's standard alloy for finish required, with temper to suit forming operations and performance required.

1. Mill Finish: As manufactured.

C. Aluminum Extrusions and Tubes: ASTM B 221, manufacturer's standard alloy and temper for type of use, finished to match assembly where used, otherwise mill finished.

D. Stainless-Steel Sheet and Shapes: ASTM A 240/A 240M or ASTM A 666, Type 304.

E. Steel Shapes: ASTM A 36/A 36M, hot-dip galvanized according to ASTM A 123/A 123M unless otherwise indicated.

F. Steel Tube: ASTM A 500, round tube.

G. Galvanized-Steel Tube: ASTM A 500, round tube, hot-dip galvanized according to ASTM A 123/A 123M.

H. Steel Pipe: ASTM A 53/A 53M, galvanized.

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.

B. Polyisocyanurate Board Insulation: ASTM C 1289, thickness as indicated.

C. Wood Nailers: Softwood lumber, pressure treated with waterborne preservatives for aboveground use, acceptable to authorities having jurisdiction, containing no arsenic or chromium, and complying with AWPA C2; not less than 1-1/2 inches (38 mm) thick.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

E. Underlayment:

1. Felt: ASTM D 226, Type II (No. 30), asphalt-saturated organic felt, nonperforated.
2. Polyethylene Sheet: 6-mil- (0.15-mm-) thick polyethylene sheet complying with ASTM D 4397.
3. Slip Sheet: Building paper, 3-lb/100 sq. ft. (0.16-kg/sq. m) minimum, rosin sized.

F. Fasteners: Roof accessory manufacturer's recommended fasteners suitable for application and metals being fastened. Match finish of exposed fasteners with finish of material being fastened. Provide nonremovable fastener heads to exterior exposed fasteners. Furnish the following unless otherwise indicated:

1. Fasteners for Zinc-Coated or Aluminum-Zinc Alloy-Coated Steel: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
3. Fasteners for Copper Sheet: Copper, hardware bronze, or passivated Series 300 stainless steel.
4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

G. Gaskets: Manufacturer's standard tubular or fingered design of neoprene, EPDM, PVC, or silicone or a flat design of foam rubber, sponge neoprene, or cork.

H. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant as recommended by roof accessory manufacturer for installation indicated; low modulus; of type, grade, class, and use classifications required to seal joints and remain watertight.

I. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for expansion joints with limited movement.

J. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.3 EQUIPMENT SUPPORTS

A. Equipment Supports: Internally reinforced metal equipment supports capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings; with welded or mechanically fastened and sealed corner joints, stepped integral metal cant raised the thickness of roof insulation**,** and integrally formed deck-mounting flange at perimeter bottom.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable product:

   a. AES Industries, Inc.
   b. Curbs Plus, Inc.
   c. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
   d. Pate Company (The).
   e. Roof Products, Inc.
   f. Thybar Corporation.
   g. Vent Products Co., Inc.

B. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.

C. Loads: See Mechanical and Structural Drawings.

D. Material: Zinc-coated (galvanized), 0.052 inch (1.32 mm).

1. Finish: Mill phosphatized.

E. Construction:

1. Insulation: Factory insulated with 1-1/2-inch- (38-mm-) thick glass-fiber board insulation.
2. Liner: Same material as equipment support, of manufacturer's standard thickness and finish.
3. Factory-installed continuous wood nailers 5-1/2 inches (140 mm) wide at tops of equipment supports.
4. Metal Counterflashing: Manufacturer's standard, removable, fabricated of same metal and finish as equipment support.
5. Fabricate equipment supports to minimum height of 12 inches (300 mm) unless otherwise indicated.
6. Sloping Roofs: Where roof slope exceeds 1:48, fabricate each support with height to accommodate roof slope so that tops of supports are level with each other. Equip supports with water diverters or crickets on sides that obstruct water flow.

2.4 PREFORMED FLASHING SLEEVES

A. Exhaust Vent Flashing: Double-walled metal flashing sleeve or boot, insulation filled, with integral deck flange, 12 inches (300 mm) high, with removable metal hood and metal collar.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable product:

a. Custom Solution Roof and Metal Products.
b. Thaler Metal USA Inc.

2. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.
3. Diameter: As indicated.
4. Finish: Manufacturer's standard.

B. Vent Stack Flashing: Metal flashing sleeve, uninsulated, with integral deck flange.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following or comparable product:

a. Custom Solution Roof and Metal Products.
b. Milcor Inc.; Commercial Products Group of Hart & Cooley, Inc.
c. Thaler Metal USA Inc.

2. Metal: Aluminum sheet, 0.063 inch (1.60 mm) thick.
3. Height: As indicated.
4. Diameter: As indicated.
5. Finish: Manufacturer's standard.

2.5 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.6 ROOF WALKWAY

A. Basis of Design – EverGuard TPO Walkway Roll, 140-mil extruded and embossed diamond pattern. Color – To be determined by Architect.

2.7 ROOF EDGE PROTECTION

Provide freestanding KeeGuard Roof Edge Protection System, including pipe railings, uprights, bases, counterweights and fittings.

A. Free standing counterweighted guardrail system with 42 inch (1067 mm) minimum height to provide a pedestrian egress barrier on the roof to withstand a minimum load of 200 lb (90719 g) in any direction to the top rail per OSHA Regulation 29 CFR 1910.23.

B. Pipe: Steel, 1-1/2 inches (48 mm) schedule 40, galvanized.

C. Tube: Galvanized tube, 12 gauge, 1-1/2 inches, 1.90 inches (48 mm) OD.

D. Rails and Posts: Galvanized Tube, 12 gauge, 1-1/2 inches 1.90 inches (38 mm) diameter.

E. Counterweight Levers: Galvanized Tube, 12 gauge, 1-1/4 inches 1.660 inches (38 mm) diameter.

F. Mounting Bases: Steel bases are galvanized and are supplied with a rubber pad on underside of the component.

G. Counterweights: Molded recycled PVC with one fixing collar per counterbalance.

H. Fasteners: stainless steel or galvanized.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

1. Verify compatibility with and suitability of substrates including compatibility with existing finishes or primers.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

C. Verify dimensions of roof openings for roof accessories.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install roof accessories according to manufacturer's written instructions.

1. Install roof accessories level, plumb, true to line and elevation, and without warping, jogs in alignment, excessive oil canning, buckling, or tool marks.
2. Anchor roof accessories securely in place so they are capable of resisting indicated loads.
3. Use fasteners, separators, sealants, and other miscellaneous items as required to complete installation of roof accessories and fit them to substrates.
4. Install roof accessories to resist exposure to weather without failing, rattling, leaking, or loosening of fasteners and seals.
5. Clean and prepare substrates for accessory installation according to manufacture’s written instructions.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum and stainless-steel roof accessories with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing roof accessories directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet, or install a course of polyethylene sheet.
3. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof accessories for waterproof performance.

C. Roof Curb Installation: Install each roof curb so top surface is level.

D. Equipment Support Installation: Install equipment supports so top surfaces are level with each other.

E. Preformed Flashing-Sleeve Installation: Secure flashing sleeve to roof membrane according to flashing-sleeve manufacturer's written instructions.

3.3 REPAIR AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing according to ASTM A 780.

B. Touch up factory-primed surfaces with compatible primer ready for field painting according to Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

C. Clean exposed surfaces according to manufacturer's written instructions.

D. Clean off excess sealants.

E. Replace roof accessories that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

3.4 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 07 72 00

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SECTION 07 84 13 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the performance criteria, materials, production, and erection of penetration firestopping for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all penetration firestopping as required by the this section, schedules.

1. Penetrations in fire-resistance-rated walls.
2. Penetrations in horizontal assemblies.
3. Penetrations in smoke barriers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.

1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."

B. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

C. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:

1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:

   a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
   b. Classification markings on penetration firestopping correspond to designations listed by the following:

      1) UL in its "Fire Resistance Directory."

D. Preinstallation Conference: Conduct conference at Project site.

1.6 REFERENCED STANDARDS

A. American Society for Testing and Materials (ASTM).

1. E 814 – Standard Method of fire Tests of Through Penetration Fire Stops.
2. E 119 – Methods of Fire Tests of Building Construction and Materials.
3. E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
4. E 136 – Test Method for Behavior of Materials in a Vertical Tube Furnace at 750F.
5. E 1399 – Cyclic Movement and Measuring Minimum and Maximum Joint Widths.
6. E 1966 – Test method for Resistance of Building Joint.
7. E 2174 – Standard practice for On-Site Inspection of Installed Firestops.
8. E 05.11.14 – Standard Test method for Determining the fire endurance of Perimeter Fire Barrier Systems Using the Intermediate-Scale, Multi Story Test Apparatus (ISMA): ASTM number pending draft approval.

B. Underwriters Laboratories, Inc. (UL).

1. UL 1479 – Fire Tests of Through Penetration fire Stops.
2. UL 263 – Fire Test of Building Construction and Materials.
3. UL 723 – Surface Burning Characteristics of Building Materials.
4. UL 2079 – Tests for Fire Resistance of Building Joint Systems.

5. UL “Fire Resistance Directory”, current year, including but not limited to the following:

   a. For penetrations by uninsulated, non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT):
      1) UL System: CAJ-1235, CAJ-1404, WL-1152.
   b. For penetrations by insulated, non-combustible items including steel pipe, cooper pipe, rigid steel conduit and electrical metallic tubing (EMT):
      1) UL Systems: CAJ-5222, CAJ-5250, CAJ-5251, WL-5171.
   c. For penetrations of PVC jacketed, flexible cable or cable bundles and plastic pipe (closed piping systems):
      1) UL Systems: CAJ-2401, CAJ-3185, CAJ-3199, CAJ-3234, WL-3118, WL-3179, WL-3199.
   d. For penetrations of combustible plastic pipe (open piping system):
      1) UL Systems: CAJ-2174, CAJ-2330, CAJ-2351, CAJ-2432, WL-2168, WL-2170, WL-2185, WL-2259.
   e. For penetrations by multiple combustible and/or non-combustible items:
      1) UL Systems: CAJ-8101, CAJ-8133, WL-8007.
   f. For large size / complex penetrations made to accommodate cable trays, multiple steel and cooper pipes, electrical busways in raceways:
      1) UL Systems: CAJ-1406, CAJ-1502, CAJ-4053, CAJ-6027, WJ6004, WL-1207, WL-2343, WL-4030, WL-6018.
   g. For penetrations by steel ducts:
      1) UL Systems: CAJ-7075, CAJ-7082, WJ-7045, WJ-7046, WL-7006, WL-7046, WL-7081, WL-7082.
   h. For fire-rated construction joints and other gaps:
      1) UL Systems: CEJ-296P, CEJ-302P.
   i. For openings between structurally separate sections of wall and floors:
      1) At the top of walls: UL systems: HWD-0107, HWD-0110, HWD-0257, HWD-0267, HWD-0299, HWD-0327, HWD-0266, HWD-0333, HWD-0334.

C. Factory Mutual (FM) Approval guide, current year.

D. National Fire Protection Association.

E. FICA “Manual of Practice”.

F. International Firestop Council (IFC).

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.

B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following, or approved equal:

1. Grace Construction Products.
2. Hilti, Inc.
3. Johns Manville.
4. NUCO Inc.
5. Passive Fire Protection Partners.
6. Specified Technologies Inc.
7. 3M Fire Protection Products.
8. Tremco, Inc.; Tremco Fire Protection Systems Group.
9. USG Corporation.

2.2 PENETRATION FIRESTOPPING

A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.

B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. Fire-resistance-rated walls include fire walls, fire-barrier walls, smoke-barrier walls and fire partitions.
2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.

C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg (2.49 Pa).

1. Horizontal assemblies include floors, floor/ceiling assemblies and ceiling membranes of roof/ceiling assemblies.
2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.

D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.

1. L-Rating: Not exceeding 5.0 cfm/sq. ft. (0.025 cu. m/s per sq. m) of penetration opening at 0.30-inch wg (74.7 Pa) at both ambient and elevated temperatures.

E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.

F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

G. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

1. Permanent forming/damming/backing materials, including the following:

   a. Slag-wool-fiber or rock-wool-fiber insulation.
   b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
   c. Fire-rated form board.
   d. Fillers for sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

2.3 FILL MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Flexible Firestop Sealant (For use where roof joists penetrate fire-rated walls): Acrylic based firestop sealant that provides movement capability in fire rated joint applications. Basis of Design: Hilti CP 606.

C. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.

D. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.

E. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.

F. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

G. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

H. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

I. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.

J. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

K. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:

1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
3. Remove laitance and form-release agents from concrete.

B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.

1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.

C. Install fill materials for firestopping by proven techniques to produce the following results:

1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.

3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. Designation of applicable testing and inspecting agency.
4. Date of installation.
5. Manufacturer's name.
6. Installer's name.

3.5 FIELD QUALITY CONTROL

A. Owner will engage a qualified testing agency to perform tests and inspections.

B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.

C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION

A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.

B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.7 PENETRATION FIRESTOPPING SCHEDULE

A. The following schedules shall be completed by the Contractor and reviewed prior to submission to the Architect. The Table included shall be completed with each of the following categories of penetrating items:

1. Single uninsulated metallic piping and conduit.

2. Multiple uninsulated metallic piping and conduit.
3. Uninsulatted plastic piping and conduit.
4. Insulated metallic piping.
5. Insulated high temperature flues and exhaust pipes (boiler flues, generator exhausts insulated with calcium silicate or on the non-combustible insulation, etc.)
6. Cable tray.
7. Electric / telephone cable.
8. Bus duct.
9. Miscellaneous penetrations.

B. Complete the additional Tables for the following, using the format provided.

1. Blanks, voids, holes (including edge of slab).
2. Engineering judgments.
3. Ductwork engineering judgments.

3.3 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 07 84 13

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SECTION 07 95 00 - EXPANSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The Work of this Section consists of the provision of all plant, labor, materials, equipment, testing and services necessary to complete the work for expansion control as shown on the schedules, keynotes, drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction, including, but not limited to, the following:

1. Interior floor wall ceiling expansion control systems.
2. Exterior wall expansion control systems.

B. Related Requirements:
1. Division 3 for Concrete Work
2. Division 5 for Structural and Non-structural Metal Work
3. Section 07 92 00 Joint Sealants
4. Section 07 54 23 TPO Roofing
5. Section 07 62 00 Sheet Metal Flashing and Trim
6. Section 07 72 00 Roof Accessories
7. Division 9 for Finish Work

1.3 ACTION SUBMITTALS

A. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, blockout requirement, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

B. Samples: For each exposed expansion control system and for each color and texture specified, full width by 6 inches (150 mm) long in size.

C. Samples for Initial Selection: For each type of expansion control system indicated.

1. Include manufacturer's color charts showing the full range of colors and finishes available for each exposed metal and elastomeric seal material.

D. Samples for Verification: For each type of expansion control system indicated, full width by 6 inches (150 mm) long in size.

E. Product Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:

1. Manufacturer and model number for each expansion control system.
2. Expansion control system location cross-referenced to Drawings.
3. Nominal joint width.
4. Movement capability.
5. Classification as thermal or seismic.
6. Materials, colors, and finishes.
7. Product options.
8. Fire-resistance ratings.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each fire barrier provided as part of an expansion control system, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.

1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.

B. Coordination: Coordinate installation of exterior wall and soffit expansion control systems with roof expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified elsewhere.

2.2 PERFORMANCE REQUIREMENTS

A. Fire-Resistance Ratings: Where indicated, provide expansion control systems with fire barriers identical to those of systems tested for fire resistance per UL 2079 or ASTM E 1966 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1. Hose Stream Test: Wall-to-wall and wall-to-ceiling systems shall be subjected to hose stream testing.

B. Seismic Performance: Expansion control systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the system will remain in place without separation of any parts when subjected to the seismic forces specified and the system will be fully operational after the seismic event."
2. Component Importance Factor is 1.5.

2.3 INTERIOR EXPANSION CONTROL SYSTEMS

A. Locations: Between existing Salzmann Building and new East and West Wing Additions and between existing Salzmann Building and new Entry Addition.

B. Basis-of-Design Product: Subject to compliance with requirements, provide products by MM Systems Corporation, as indicated on the drawings or a comparable product by one of the following:

1. Architectural Art Mfg., Inc.; Division of Pittcon Industries.
2. Balco, Inc.
3. JointMaster/InPro Corporation.
4. Michael Rizza Company, LLC.
5. Construction Specialties, Inc.
6. Nystrom, Inc.

C. Source Limitations: Obtain expansion control systems from single source from single manufacturer.

D. Interior Expansion Control System Requirement:

1. Floor to Floor - LASD
2. Floor to Wall – FSSTE
3. Wall to Wall – VSW
4. Wall to Corner – VSWL
5. Wall to Ceiling – VSWL
6. Ceiling to Ceiling – VSG
7. Wall to Soffit – VSWL

E. Finishes shall be compatible with adjacent materials or as designated in the drawings.

2.4 EXTERIOR WALL EXPANSION CONTROL SYSTEMS

A. Basis-of-Design Product: Subject to compliance with requirements, provide products by MM Systems Corporation, as indicated on the drawings or a comparable product by one of the following:

1. Architectural Art Mfg., Inc.; Division of Pittcon Industries.
2. Balco, Inc.
3. JointMaster/InPro Corporation.
4. Michael Rizza Company, LLC.
5. Construction Specialties, Inc.
6. Nystrom, Inc.

B. Source Limitations: Obtain expansion control systems from single source from single manufacturer.

C. Fire Resistance Rating: same as adjacent construction.

D. Exterior Expansion Control System Requirement with cover plates:
   1. Wall to Wall – ESS
   2. Wall to Corner – ESS

E. Exposed gasket: Extruded flexible gasket. Color as selected by Architect from manufacture's full range.

2.5 MATERIALS

A. Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063-T5 for extrusions; ASTM B 209 (ASTM B 209M), Alloy 6061-T6 for sheet and plate.

   1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

B. Elastomeric Seals: ASTM E 1783; preformed elastomeric membranes or extrusions to be installed in metal frames.

C. Compression Seals: ASTM E 1612; preformed elastomeric extrusions having an internal baffle system and designed to function under compression.

D. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.

E. Elastomeric Concrete: Modified epoxy or polyurethane extended into a prepackaged aggregate blend, specifically designed for bonding to concrete substrates.

F. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required fire-resistance rating.

G. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

H. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Mill finish.

B. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces where expansion control systems will be installed for installation tolerances and other conditions affecting performance of work.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to expansion control system manufacturer's written instructions.

B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion control systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion control systems.

C. Cast-In Frames: Coordinate and furnish frames to be cast into concrete.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.

B. Metal Frames: Perform cutting, drilling, and fitting required to install expansion control systems.

1. Install in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.
2. Adjust for differences between actual structural gap and nominal design gap due to ambient temperature at time of installation. Notify Architect where discrepancies occur that will affect proper expansion control system installation and performance.
3. Cut and fit ends to accommodate thermal expansion and contraction of metal without buckling of frames.

4. Repair or grout blockout as required for continuous frame support using nonmetallic, shrinkage-resistant grout.
5. Install frames in continuous contact with adjacent surfaces.
   a. Shimming is not permitted.

6. Locate anchors at interval recommended by manufacturer, but not less than 3 inches (75 mm) from each end and not more than 24 inches (600 mm) o.c.

C. Seals in Metal Frames: Install elastomeric seals and membranes in frames to comply with manufacturer's written instructions. Install with minimum number of end joints.

1. Provide in continuous lengths for straight sections.
2. Seal transitions according to manufacturer's written instructions. Vulcanize or heat-weld field-spliced joints as recommended by manufacturer.
3. Installation: Mechanically lock seals into frames or adhere to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.

D. Compression Seals: Apply adhesive or lubricant adhesive as recommended by manufacturer before installing compression seals.

E. Foam Seals: Install with adhesive recommended by manufacturer.

F. Epoxy-Bonded Seals: Pressurize seal for time period and to pressure recommended by manufacturer. Do not overpressurize.

G. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.

H. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion control system materials and associated work so complete assemblies comply with assembly performance requirements.

1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.

I. Moisture Barrier: Provide at all exterior joints and where indicated on Drawings. Provide drainage fittings at a maximum of 50 feet (15.2 m) or where indicated on Drawings.

3.4 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion control systems. Reinstall cover plates or seals prior to Substantial Completion of the Work.

3.5 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 07 95 00

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SECTION 080671 – DOOR HARDWARE SCHEDULE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section references specification sections relating to commercial door hardware for the following:

1. Swinging doors.
2. Sliding Doors.
3. Other doors to the extent indicated.

B. Commercial door hardware includes, but is not necessarily limited to, the following:

1. Mechanical door hardware.
2. Electromechanical and access control door hardware.
3. Electromechanical and access control door hardware power supplies, back-ups and surge protection.
4. Automatic operators.
5. Cylinders specified for doors in other sections.

C. Related Sections:

1. Division 08 Section “Door Hardware”.
2. Division 28 Section “Access Control”.

D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.

1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
2. ICC/IBC - International Building Code.
3. NFPA 70 - National Electrical Code.
4. NFPA 80 - Fire Doors and Windows.
5. NFPA 101 - Life Safety Code.
6. NFPA 105 - Installation of Smoke Door Assemblies.
7. State Building Codes, Local Amendments.

E. Standards: Reference Related Sections for requirements regarding compliance with applicable industry standards.

1.3 COORDINATION

A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Security: Coordinate installation of door hardware, keying, and access control with Owner'sv security consultant.

C. Contractor is responsible for purchasing and coordinating all cores, keying and schedules with the campus. Campus shall perform installation.

1.4 COORDINATION AND MEETINGS

A. Location: Conduct conferences on project site or other location as directed by the Architect/Owner.

B. Preinstallation Conference
   1. Purpose of Preinstallation conference is to:
      a. Coordinate between trades, so all understand their responsibilities.
      b. To instruct the installing contractors personnel on the proper installation and adjustment of their respective products.
         1) Hardware supplier is responsible for bringing the installation instructions to the meeting
      c. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
      d. Review sequence of operation narratives for each unique access-controlled opening.
      e. Review the requirements for local and state building codes and how they apply to doors, frames and hardware.
         1) Opening forces to follow DOJ's "2010 ADA Standards for accessible design".
      f. Review any special applications.
   2. Conference participants shall include but not limited to:
      a. Construction Manager
      b. Installer for doors, frames and hardware.
      c. Supplier Representative
      d. Owner and/or Owner Representative.
      e. Engineer and/or Engineers Consultant.

C. Keying Conference
   1. Incorporate conference decisions into keying schedule after reviewing door hardware keying system including, but not limited to the following:
      a. Flow of traffic and degree of security required
      b. Preliminary key system schematic diagram.
      c. Requirements for key control system
         1) This is to include the number of keys per keyset.

2) Number of Master level keys
3) Use of Keyed construction cores

d. Requirements for access control.
e. Address for delivery of keys

2. Keying Conference participants shall include but not limited to:
   a. Supplier Representative
   b. Owner and/or Owner Representative.
   c. Engineer and/or Engineer Consultant

1.5 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."

2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.

3. Content: Include the following information:

   a. Type, style, function, size, label, hand, and finish of each door hardware item.
   b. Manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
   e. Explanation of abbreviations, symbols, and codes contained in schedule.
   f. Mounting locations for door hardware.
   g. Door and frame sizes and materials.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.

C. Keying Schedule: It is the responsibility of the Contractor to prepare the keying schedule in coordination with the Owner, separate schedule detailing final keying instructions for locksets and cylinders in writing. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner to approve submitted keying schedule prior to the ordering of permanent cylinders.

D. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

E. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and contact information of the manufacturers providing the hardware and their nearest service representatives. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.

F. Warranties and Maintenance: Special warranties and maintenance agreements specified in the Related Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.

B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.

C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of door hardware from single manufacturer.
   1. Provide electrified door hardware from same manufacturer as mechanical door hardware unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency accepted to authorities having jurisdiction are acceptable.

2.2 PERFORMANCE REQUIRMENTS

A. Means of Egress Doors: Latches do not require more than 15lbf to release the latch. Locks do not require use of a key, tool or special knowledge for operation.

B. Accessibility Requirements: For door hardware on doors in an accessible route, comply with DOJ's "2010 ADA Standards for Accessible Design".
   1. Provide operating devices that do not require tight grasping, pinching or twisting of the wrist that operate with a force of not more than 5lbf.
   2. Comply with the following maximum opening-force requirements:
      a. Interior, hinged doors: 5lbf applied perpendicular to the door.
      b. Sliding or Folding Doors: 5lbf applied parallel to the door at the latch.
      c. Provide thresholds not more than 1/2" high.
      d. Adjust door closer sweep periods so that, from an open position of 90 degrees, the door will take at least 5 seconds to move to a position of 12 degrees from the latch.
      e. Adjust spring hinges so that, from an open position of 70 degrees, the door will take at least 1.5 seconds to move to the closed position.

2.3 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. For products furnished, but not installed, under this section, Coordinating, purchasing, delivering and scheduling remain requirements of this section.

C. Equals: Request for equals and product approval for inclusive mechanical and electromechanical door hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlines in

Division 01. Approval of requests is at the discretion of the architect, Owner and their designated consultants.

D. Substitutions: Are not allowed unless the listed product(s) are no longer available,

2.4 HINGES

A. Hinges are to meet or exceed ANSI/BHMA A156.1 requirements.

B. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

C. Hinge Size: Provide the size listed in the hardware sets.

D. Hinge Type: Provide the type listed in the hardware sets.

E. Manufacturers:
   1. Hager Companies (HA) – BB Series, 5 knuckle. (Basis of Design)
   2. Ives (IV) – 5BB Series, 5 knuckle
   3. McKinney (MK) – TA/T4A Series, 5 knuckle.

2.5 CONTINOUS HINGES

A. Geared continuous hinges shall meet ANSI/BHMA 156.26, Grade 1 requirements.

B. Manufactured out of 6063-T5 aluminum, pinless, geared hinge leaves joined by a continuous extruded aluminum channel cap; with concealed, self-lubricating bearings.

C. Provide template-produced hinges for hinges installed on hollow-metal and aluminum doors and frames.

D. Manufactures:
   1. Roton (RT) – (Basis of Design)
   2. Pemko (PE)
   3. McKinney (MK)

2.6 POWER TRANSFER DEVICES

A. Concealed Quick Connect Electric Power Transfers: Provide concealed wiring pathway housing mortised into the door and frame for low voltage electrified door hardware. Furnish with Molex standardized plug connectors and sufficient number of concealed wired (up to 12) to accommodate the electrified functions specified in the Door Hardware Sets. Connectors plug directly to through-door wiring harness for connection to electric locking devices and power supplies. Wire nut connections are not acceptable.
   1. Manufacturers:

a. Pemko (PE) – EL-CEPT Series. (Basis of Design)
b. Securitron (SU) – EL CEPT Series.
c. Dormakaba Best (ST) – EPT-12C Series

2.7 MECHANICAL LOCK AND LATCHING DEVICE

A. Cylindrical Locks:
1. Locks shall meet or exceed ANSI/BHMA A156.2 Series 4000 Operation Grade 1 requirements.
2. Locks are to be non-handed and fully reversible.
3. Backset:
   a. 2-3/4” unless otherwise shown in hardware sets
4. Lock trim an function as shown in hardware sets.
5. Latch bolt:
   a. Provide deadlocking latch bolt for all locks with keyed function.
6. Manufacturers:
   a. BEST (BE) – Series 9K (Basis of Design)
   b. SARGENT (SA)
   c. Corbin Russwin

2.8 EXIT DEVICES

A. Exit Devices and Auxiliary Items shall meet or exceed ANSI/BHMA A156.3, Grade 1 requirements.

B. Where function of the Exit Device requires a cylinder, provide a cylinder per the requirements of the Keying System.

C. Function and Trim design as listed in the Hardware Sets.

D. Provide mounting bracket or spaced as required for proper installation and operation.

E. Do not cut perimeter gasket to mount the Exit Device Strikes. Adjust template accordingly.

F. Manufacturers:
1. SARGENT (SA) – (Basis of Design)
2. BEST (BE)
3. Corbin Russwin

2.9 CYLINDERS AND KEYING

A. Cylinders: Original manufacturer cylinders complying with the following:
1. Tumbler type, constructed from brass or bronze, stainless steel or nickel silver.
2. Meet or exceed ANSI/BHMA A156.5 Grade 1 requirements.

3. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
4. Rim Type: Cylinders with black plate, flat-type vertical or horizontal tailpiece, and raised trim ring.

    a. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes. Stamped collars are not allowed.
5. Face finish to match lockset.
6. Core Type: Small format interchangeable core (SFIC).
7. Permanent Core: SFIC to match existing system.
8. Keying: As required to match existing system.

B. Construction Keying:
1. Construction Master Keys: Provide temporary keyed construction cores.

    a. Provide 10 construction master keys.

C. Key Registration List:
1. Provide transcript list in writing or electronic file (proper format) as directed by the Owner.
2. Furnish a list of opening numbers with locking devices, showing cylinders types and quantities required when cylinders or cores are to be Owner furnished.

D. Manufacturers:
1. BEST (BE) – (No Substitution)

2.10 ELECTRIC STRIKES

A. Electric strikes shall meet or exceed ANSI/BHMA A156.31, Grade 1 requirements.
1. Shall be for use on non-rated or fire-rated openings.
2. Strikes shall be tested to a minimum endurance of 1 million operating cycles.
3. Provide strikes with 12 or 24 VDC capability, fail-secure unless otherwise specified.
4. Where specified provide latchbolt and latchbolt strike monitoring indicating both the
position of the latchbolt and locked condition of the strike.
5. Manufacturers:
    a. HES – (Basis of Design)
    b. Rockwood (RO)
    c. Von Duprin

2.11 SURFACE CLOSERS

A. Surface Closers shall meet or exceed ANSI/BHMA A156.4, Grade 1 requirements.

B. Surface Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.

C. Closer bodies shall be constructed of cast iron with 1 ½" bore.

D. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use.

E. Provide Surface Closers complying the Americans with Disabilities Act, ANSI ICC/A117.1.

F. Provide accessories including custom templates, special mounting brackets, spacers and drop plates as required for proper installation and operation.

G. Coordinate with Overhead Holder/Stop installation, provide special templates as required to avoid hardware conflicts.

H. Door closers which incorporate pressure relief valve technology (PRV) are not acceptable.

I. Manufacturers:
   1. Hager 5100 Series Heavy Duty Closer (Basis of Design)
   2. Corbin Russwin Hardware (RU) – DC6000 Series
   3. Norton Rixson (NO) – 7500 Series

2.12 OVERHEAD STOPS AND HOLDERS

A. Stops and Holders shall meet or exceed ANSI/BHMA A156.8, Grade 1 requirements.

B. Provide units that are through bolted on all Wood Door applications.

C. Coordinate with door closer installation, special templating may be required.

D. Where stops and holders are specified, coordinate with door manufacturer to insure proper application, installation, and operation.

E. Function as show in Hardware Sets.

F. Manufacturers:
   1. Rixson (RF) – (Basis of Design)
   2. Architectural Builders Hardware
   3. Glynn Johnson

2.13 ARCHITECTURAL TRIM

A. Protective Plates:
   1. Shall meet ANSI/BHMA A156.6 requirements.
   2. Protective plates, fabricated from the following:

      a. Stainless Steel: 300 grade, 050-inch thick.
   3. Kick Plates are to be installed on the push side of the door, unless stated otherwise.
   4. Size: Fabricate protection plates not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates.
   5. Provide Plates with countersunk screw holes.
   6. Provide Plates are to be beveled on all 4 edges.
   7. Height: 10”, unless noted otherwise.
   8. Manufacturers:
      a. Pemko (PE) – (Basis of Design)
      b. Rockwood (RO)
      c. Ives

2.14 SWEEPS, WEATHERSTRIP AND GASETING

A. Door Gasketing shall comply with ANSI/BHMA A156.22 requirements

B. Provide with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

C. Perimeter gasketing should not be cut around door hardware. Gaskets must maintain a continuous seal at top and vertical edges. Adjust hardware templates accordingly.

D. Manufacturers:
   1. Pemko (PE) – (Basis of Design)
   2. Zero
   3. K.N. Crowder

2.15 THRESHOLDS

A. Thresholds shall comply with ANSI/BHMA A156.21 requirements.

B. Thresholds shall be fabricated to full width of opening.

C. Provide non-slip surface.

D. Provide Stainless Steel Fasteners, type as detailed or required for specific floor conditions.

E. Manufacturers:
   1. Pemko (PE) – (Basis of Design)
   2. Zero
   3. K.N. Crowder

2.16 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rating labels and as otherwise approved by Architect.
   1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.
   1. The use of Aluminum or Brass/Bronze based screws is not acceptable.

C. Fasteners: Provided by door hardware manufacturer, to comply with published installation instructions, templates and as test for fire rated applications.
   1. The use of other fasteners will be rejected.
   2. Provide Phillips flat-head screws with finished heads to match surface of door hardware unless otherwise indicated.
   3. The use of Self-Drilling or Self-Tapping Screws is not permitted.
   4. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners.
   5. Gasket Fasteners: Provide Stainless Steel fasteners.
   6. Threshold Fasteners:

      a. Concrete floors: Provide ¼-20 Stainless Steel Machine Screws and Expansion Shields.
   7. Hinge Fasteners:
      a. Provide steel or stainless steel screw to match hinge base material.
      b. Provide Machine Screws for metal door and frame applications.

2.17 FINISHES

A. Provide finishes complying with ANSI/BHMA A156.18 as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other

components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 DOOR HARDWARE SETS

A. The door hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.

1. Quantities listed are for each pair of doors, or for each single door.

2. The supplier is responsible for handing and sizing all products.

3. Where multiple options for a piece of hardware are given in a single line item, the supplier shall provide the appropriate application for the opening.

4. At existing openings with new hardware the supplier shall field inspect existing conditions prior to the submittal stage to verify the specified hardware will work as required. Provide alternate solutions and proposals as needed.

B. Products listed in the hardware sets shall be supplied by and in accordance with the requirements described in the specification section as noted for each item.

1. Section 28 13 00 – Access Control.

C. Manufacturer's Abbreviations:

1. MK - McKinney
2. PE - Pemko
3. SU - Securitron
4. RO - Rockwood
5. SA - SARGENT
6. BE - BEST Locks & Closers
7. RF - Rixson
8. NO - Norton
9. OT - Other

Hardware Sets

Set: 1.0

Doors: 208A, 208B, 435

2	Continuous Hinge	FM__SLF-HD1 x PT	C	PE	080671
2	Electric Power Transfer	EL-CEPT	630	SU	080671
1	Concealed Vert Rod Exit, Nightlatch	16 55 56 72 ADPE8410 P106	US32D	SA	080671
1	Concealed Vert Rod Exit, Dummy	16 55 56 72 ADPE8410 EO	US32D	SA	080671
3	Permanent Core - 7 Pin	CORMAX (Compatible with Facility's Existing System)	626	BE	080671
2	Door Pull	RM3310-LAR	US32D	RO	080671
2	Conc Overhead Stop	6-X36	630	RF	080671
2	Surface Closer	7500 / P7500	689	NO	080671
2	Drop Plate	As Required	689	NO	080671
1	Threshold	253x3AFG MSES10SS-2		PE	080671
2	ElectroLynx Harness - Frame	QC-C1500P		MK	080671
2	ElectroLynx Harness - Door	QC-CXXX (Size as Required)		MK	080671
1	Wiring Diagram	Point to Point			080671
2	Position Switch	DPS-M/W-BK		SU	080671
1	Card Reader	by Security System Supplier		OT	281300
1	Power Supply	AQL Series (Amps & Relays as Required)		SU	080671

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Operating inside trim activates request to exit switch shunting door contact and allowing authorized egress at all times. With loss of power door remains locked.

Set: 2.0

Doors: 201A, 201B

1	Continuous Hinge	FM__SLF-HD1 x PT	C	PE	080671
1	Electric Power Transfer	EL-CEPT	630	SU	080671
1	Rim Exit Device	16 55 56 82 PE8504	US32D	PE	080671
1	Concealed Vert Rod Exit, Nightlatch	16 55 56 72 ADPE8410 P106	US32D	SA	080671
1	Concealed Vert Rod Exit, Dummy	16 55 56 72 ADPE8410 EO	US32D	SA	080671
3	Permanent Core - 7 Pin	CORMAX (Compatible with	626	BE	080671

	Facility's Existing System)				
1 Door Pull	RM3310-LAR	US32D	RO	080671	
1 Conc Overhead Stop	6-X36	630	RF	080671	
1 Surface Closer	7500 / P7500	689	NO	080671	
1 Drop Plate	As Required	689	NO	080671	
1 Threshold	253x3AFG MSES10SS-2		PE	080671	
1 ElectroLynx Harness - Frame	QC-C1500P		MK	080671	⚡
1 ElectroLynx Harness - Door	QC-CXXX (Size as Required)		MK	080671	⚡
1 Wiring Diagram	Point to Point			080671	
1 Position Switch	DPS-M/W-BK		SU	080671	⚡
1 Card Reader	by Security System Supplier		OT	281300	
1 Power Supply	AQL Series (Amps & Relays as Required)		SU	080671	⚡

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Operating inside trim activates request to exit switch shunting door contact and allowing authorized egress at all times. With loss of power door remains locked.

Set: 3.0

Doors: 100A, 100B, 100C, 100G, 100H

1 Continuous Hinge	FM__SLF-HD1 x PT	C	PE	080671	
1 Electric Power Transfer	EL-CEPT	630	SU	080671	⚡
1 Rim Exit Device, Storeroom	16 72 PE8504 NEB	US32D	SA	080671	
2 Permanent Core - 7 Pin	CORMAX (Compatible with Facility's Existing System)	626	BE	080671	
1 Conc Overhead Stop	6-X36	630	RF	080671	
1 Surface Closer	7500 / P7500	689	NO	080671	
1 Drop Plate	As Required	689	NO	080671	
1 Threshold	253x3AFG MSES10SS-2		PE	080671	
1 ElectroLynx Harness - Frame	QC-C1500P		MK	080671	⚡
1 ElectroLynx Harness - Door	QC-CXXX (Size as Required)		MK	080671	⚡
1 Wiring Diagram	Point to Point			080671	
1 Position Switch	DPS-M/W-BK		SU	080671	⚡
1 Card Reader	by Security System Supplier		OT	281300	
1 Power Supply	AQL Series (Amps & Relays as Required)		SU	080671	⚡

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Operating inside trim activates request to exit switch shunting door contact and allowing authorized egress at all times. With loss of power door remains locked.

Set: 4.0

Doors: 301

2 Continuous Hinge	FM__HD1 PT	C	PE	080671	
1 Electric Power Transfer	EL-CEPT	630	SU	080671	⚡
1 Dust Proof Strike	570	US26D	RO	080671	
2 Flush Bolt	555	US26D	RO	080671	
1 Fail Secure Lock	RX 72 10XG71 LB	US26D	SA	080671	⚡
1 Permanent Core - 7 Pin	CORMAX (Compatible with Facility's Existing System)	626	BE	080671	
2 Conc Overhead Stop	1-X36	630	RF	080671	
1 Surface Closer	7500 / P7500	689	NO	080671	
2 Astragal	18041CNB		PE	080671	
2 Sweep	345AV		PE	080671	
1 Threshold	253x3AFG MSES10SS-2		PE	080671	
1 ElectroLynx Harness - Frame	QC-C1500P		MK	080671	⚡
1 ElectroLynx Harness - Door	QC-CXXX (Size as Required)		MK	080671	⚡
1 Wiring Diagram	Point to Point			080671	
2 Position Switch	DPS-M/W-BK		SU	080671	⚡
1 Card Reader	by Security System Supplier		OT	281300	
1 Power Supply	AQL Series (Amps & Relays as Required)		SU	080671	⚡

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Operating inside trim activates request to exit switch shunting door contact and allowing authorized egress at all times. With loss of power door remains locked.

Set: 5.0

Doors: 409

2 Continuous Hinge	FM__HD1 PT	C	PE	080671	
1 Electric Power Transfer	EL-CEPT	630	SU	080671	⚡

1 Dust Proof Strike	570	US26D	RO	080671	
2 Flush Bolt	555	US26D	RO	080671	
1 Access Control Cyl Lock	72 SN200-10XG271 LB	US26D	SA	080671	⚡
1 Permanent Core - 7 Pin	CORMAX (Compatible with Facility's Existing System)	626	BE	080671	
2 Conc Overhead Stop	1-X36	630	RF	080671	
1 Surface Closer	7500 / P7500	689	NO	080671	
2 Astragal	18041CNB		PE	080671	
2 Sweep	345AV		PE	080671	
1 Threshold	253x3AFG MSES10SS-2		PE	080671	
1 ElectroLynx Harness - Frame	QC-C1500P		MK	080671	⚡
1 ElectroLynx Harness - Door	QC-CXXX (Size as Required)		MK	080671	⚡
1 Wiring Diagram	Point to Point			080671	
2 Position Switch	DPS-M/W-BK		SU	080671	⚡
1 Power Supply	AQL Series (Amps & Relays as Required)		SU	080671	⚡

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Operating inside trim activates request to exit switch shunting door contact and allowing authorized egress at all times. With loss of power door remains locked.

Set: 6.0

Doors: 125, 208C, 221

1 Continuous Hinge	FM__HD1 PT	C	PE	080671	
1 Electric Power Transfer	EL-CEPT	630	SU	080671	⚡
1 Fail Secure Lock	RX 72 10XG71 LB	US26D	SA	080671	⚡
1 Permanent Core - 7 Pin	CORMAX (Compatible with Facility's Existing System)	626	BE	080671	
1 Surface Closer	7500 / P7500	689	NO	080671	
1 Wall Stop	404	US26D	RO	080671	
1 Sweep	345AV		PE	080671	
1 Threshold	253x3AFG MSES10SS-2		PE	080671	
1 ElectroLynx Harness - Frame	QC-C1500P		MK	080671	⚡
1 ElectroLynx Harness - Door	QC-CXXX (Size as Required)		MK	080671	⚡
1 Wiring Diagram	Point to Point			080671	
1 Position Switch	DPS-M/W-BK		SU	080671	⚡

1 Card Reader	by Security System Supplier		OT	281300
1 Power Supply	AQL Series (Amps & Relays as Required)		SU	080671

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Operating inside trim activates request to exit switch shunting door contact and allowing authorized egress at all times. With loss of power door remains locked.

Set: 7.0

Doors: 220, 397

1 Continuous Hinge	FM__HD1 PT	C	PE	080671
1 Electric Power Transfer	EL-CEPT	630	SU	080671
1 Access Control Cyl Lock	72 SN200-10XG271 LB	US26D	SA	080671
1 Cylinder	As Required x Temp Core	US15	SA	080671
1 Conc Overhead Stop	1-X36	630	RF	080671
1 Surface Closer	7500 / P7500	689	NO	080671
1 Sweep	345AV		PE	080671
1 Threshold	253x3AFG MSES10SS-2		PE	080671
1 ElectroLynx Harness - Frame	QC-C1500P		MK	080671
1 ElectroLynx Harness - Door	QC-CXXX (Size as Required)		MK	080671
1 Wiring Diagram	Point to Point			080671
1 Position Switch	Provided with locking device		SU	080671
1 Power Supply	AQL Series (Amps & Relays as Required)		SU	080671

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Operating inside trim activates request to exit switch shunting door contact and allowing authorized egress at all times. With loss of power door remains locked.

Set: 8.0

Doors: 101, 108

1 Continuous Hinge	FM__HD1 PT	C	PE	080671	
1 Electric Power Transfer	EL-CEPT	630	SU	080671	⚡
1 Access Control Cyl Lock	72 SN200-10XG271 LB	US26D	SA	080671	⚡
1 Permanent Core - 7 Pin	CORMAX (Compatible with Facility's Existing System)	626	BE	080671	
1 Surface Closer	7500 / P7500	689	NO	080671	
1 Wall Stop	404	US26D	RO	080671	
3 Silencer	608		RO	080671	
1 ElectroLynx Harness - Frame	QC-C1500P		MK	080671	⚡
1 ElectroLynx Harness - Door	QC-CXXX (Size as Required)		MK	080671	⚡
1 Wiring Diagram	Point to Point			080671	
1 Position Switch	Provided with locking device		SU	080671	⚡
1 Power Supply	AQL Series (Amps & Relays as Required)		SU	080671	⚡

Notes:

Door closed & locked at all times. Presenting valid credential outside shunts integrated door position switches & allows for authorized entrance. Operating inside trim activates request to exit switch in lock shunting integrated door position switch and allowing authorized egress at all times. With loss of power or activation of building fire system door remains locked.

Set: 9.0

Doors: 116, 117, 117A, 118, 118A

1 Continuous Hinge	FM__HD1 PT	C	PE	080671	
1 Electric Power Transfer	EL-CEPT	630	SU	080671	⚡
1 Access Control Cyl Lock	72 SN200-10XG271 LB	US26D	SA	080671	⚡
1 Permanent Core - 7 Pin	CORMAX (Compatible with Facility's Existing System)	626	BE	080671	
1 Surface Closer	7500 / P7500	689	NO	080671	
1 Wall Stop	404	US26D	RO	080671	
3 Silencer	608		RO	080671	
1 ElectroLynx Harness - Frame	QC-C1500P		MK	080671	⚡
1 ElectroLynx Harness - Door	QC-CXXX (Size as Required)		MK	080671	⚡
1 Wiring Diagram	Point to Point			080671	

1 Position Switch	Provided with locking device		SU	080671
1 Power Supply	AQL Series (Amps & Relays as Required)		SU	080671

Notes:

Door closed & locked at all times. Presenting valid credential outside shunts integrated door position switches & allows for authorized entrance. Operating inside trim activates request to exit switch in lock shunting integrated door position switch and allowing authorized egress at all times. With loss of power or activation of building fire system door remains locked.

Set: 10.0

Doors: 201C, 434A, 436

1 Continuous Hinge	FM__SLF-HD1	C	PE	080671
1 Storeroom/Closet Lock	72 10XG04 LB	US26D	SA	080671
1 Permanent Core - 7 Pin	CORMAX (Compatible with Facility's Existing System)	626	BE	080671
1 Conc Overhead Stop	6-X36	630	RF	080671
1 Surface Closer	7500 / P7500	689	NO	080671
1 Threshold	253x3AFG MSES10SS-2		PE	080671

Set: 10.1

Doors: 434B

2 Continuous Hinge	FM__SLF-HD1	C	PE	080671
1 Dust Proof Strike	570	US26D	RO	080671
2 Flush Bolt	555	US26D	RO	080671
1 Storeroom/Closet Lock	72 10XG04 LB	US26D	SA	080671
1 Permanent Core - 7 Pin	CORMAX (Compatible with Facility's Existing System)	626	BE	080671
2 Conc Overhead Stop	6-X36	630	RF	080671
1 Surface Closer	7500 / P7500	689	NO	080671
1 Threshold	253x3AFG MSES10SS-2		PE	080671

Set: 11.0

Doors: 100D, 100E, 100F, 100I, 100J

1 Continuous Hinge	FM__SLF-HD1	C	PE	080671
2 Door Pull	RM3310-LAR	US32D	RO	080671
1 Conc Overhead Stop	6-X36	630	RF	080671
1 Surface Closer	7500 / P7500	689	NO	080671
1 Sweep	345AV		PE	080671

Set: 12.0

Doors: 101A, 119, 120, 210, 211, 212

2 Hinge, Full Mortise	TA2714	US26D	MK	080671
1 Hinge, Full Mortise	TA2714 QC	US26D	MK	080671
1 Access Control Cyl Lock	72 SN200-10XG271 LB	US26D	SA	080671
1 Permanent Core - 7 Pin	CORMAX (Compatible with Facility's Existing System)	626	BE	
1 Concealed Overhead Stop	2-X36	630	RF	080671
1 Surface Closer	7500 / P7500	689	NO	080671
3 Silencer	608		RO	080671
1 ElectroLynx Harness - Frame	QC-C1500P		MK	080671
1 ElectroLynx Harness - Door	QC-CXXX (Size as Required)		MK	080671
1 Wiring Diagram	Point to Point			080671
1 Position Switch	Provided with locking device		SU	080671
1 Power Supply	AQL Series (Amps & Relays as Required)		SU	080671

Notes: Door closed & locked at all times. Presenting valid credential outside shunts door position switches & allows for authorized entrance. Operating inside trim activates request to exit switch shunting door contact and allowing authorized egress at all times. With loss of power door remains locked.

Set: 13.0

Doors: 205

6 Hinge, Full Mortise	TA2714	US26D	MK	080671
1 Dust Proof Strike	570	US26D	RO	080671

2 Flush Bolt	555	US26D	RO	080671
1 Classroom Deadlock	72 4877	US26D	SA	080671
1 Permanent Core - 7 Pin	CORMAX (Compatible with Facility's Existing System)	626	BE	080671
2 Door Pull	108	US32D	RO	080671
2 Push Plate	70C (4 x 16)	US32D	RO	080671
2 Conc Overhead Stop	1-X36	630	RF	080671
2 Surface Closer	7500 / P7500	689	NO	080671
2 Silencer	608		RO	080671

Set: 14.0

Doors: 105, 107, 204

3 Hinge, Full Mortise	TA2714	US26D	MK	080671
1 Classroom Deadlock	72 4877	US26D	SA	080671
1 Permanent Core - 7 Pin	CORMAX (Compatible with Facility's Existing System)	626	BE	080671
1 Door Pull	108	US32D	RO	080671
1 Push Plate	70C (4 x 16)	US32D	RO	080671
1 Surface Closer	7500 / P7500	689	NO	080671
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	080671
1 Wall Stop	404	US26D	RO	080671
3 Silencer	608		RO	080671

Set: 15.0

Doors: 104, 122, 123, 124, 126, 127, 128, 203, 211A

3 Hinge, Full Mortise	TA2714	US26D	MK	080671
1 Storeroom/Closet Lock	72 10XG04 LB	US26D	SA	080671
1 Permanent Core - 7 Pin	CORMAX (Compatible with Facility's Existing System)	626	BE	080671
1 Surface Closer	7500 / P7500	689	NO	080671
1 Wall Stop	404	US26D	RO	080671
1 Gasketing	S44BL		PE	080671

Set: 16.0

Doors: 116A, 121

3 Hinge, Full Mortise	TA2714	US26D	MK	080671
1 Storeroom/Closet Lock	72 10XG04 LB	US26D	SA	080671

1 Permanent Core - 7 Pin	CORMAX (Compatible with Facility's Existing System)	626	BE	080671
1 Concealed Overhead Stop	2-X36	630	RF	080671
3 Silencer	608		RO	080671

Set: 17.0

Doors: 113, 396, 433

3 Hinge, Full Mortise	TA2714	US26D	MK	080671
1 Passage Latch	10XU15 LB	US26D	SA	080671
1 Surface Closer	7500 / P7500	689	NO	080671
1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	080671
1 Wall Stop	404	US26D	RO	080671

Set: 18.0

Doors: 204A, 204B, 204C, 204D

3 Hinge, Full Mortise	TA2714	US26D	MK	080671
1 Passage Latch	10XU15 LB	US26D	SA	080671
1 Deadbolt	V21 465	US26D	SA	080671
1 Wall Stop	404	US26D	RO	080671
3 Silencer	608		RO	080671

Set: 19.0

Doors: 204E, 204F

3 Hinge, Full Mortise	TA2714	US26D	MK	080671
1 Passage Latch	10XU15 LB	US26D	SA	080671
1 Deadbolt	V21 465	US26D	SA	080671
1 Concealed Overhead Stop	2-X36	630	RF	080671
3 Silencer	608		RO	080671

Set: 20.0

Doors: 106, 202, 209

3 Hinge, Full Mortise	TA2714	US26D	MK	080671
1 Passage Latch	10XU15 LB	US26D	SA	080671
1 Deadbolt	V21 465	US26D	SA	080671
1 Concealed Overhead Stop	2-X36	630	RF	080671

1 Kick Plate	K1050 10" high CSK BEV	US32D	RO	080671
3 Silencer	608		RO	080671

Set: 21.0

Doors: 209G

3 Hinge, Full Mortise, Hvy Wt	T4A3386 [NRP]	US32D	MK	080671
1 Entry Lock	72 10XG24 LB	US26D	SA	080671
1 Permanent Core - 7 Pin	CORMAX (Compatible with Facility's Existing System)	626	BE	080671
1 Conc Overhead Stop	1-X36	630	RF	080671
1 Surface Closer	7500 / P7500	689	NO	080671
1 Drop Plate	As Required	689	NO	080671
1 Sweep	345AV		PE	080671
1 Threshold	253x3AFG MSES10SS-2		PE	080671

Set: 22.0

Doors: 302

3 Hinge, Full Mortise, Hvy Wt	T4A3386 [NRP]	US32D	MK	080671
1 Entry Lock	72 10XG24 LB	US26D	SA	080671
1 Permanent Core - 7 Pin	CORMAX (Compatible with Facility's Existing System)	626	BE	080671
1 Surface Closer	7500 / P7500	689	NO	080671
1 Wall Stop	404	US26D	RO	080671
1 Sweep	345AV		PE	080671
1 Threshold	253x3AFG MSES10SS-2		PE	080671

END OF SECTION 080671

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SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work performed under this Section includes the performance criteria, materials, production, and erection of hollow-metal work for the project and consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all hollow-metal work as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities.

B. Related Requirements:

1. Division 08 “Door Hardware" for door hardware for hollow-metal doors.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames with wall types in which they are installed. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

B. Coordinate installation of hollow-metal doors with existing hollow-metal door frames or existing wood frames. Contractor to verify existing frames are UL approved for fire-rated openings. Provide survey of existing hollow-metal frame showing existing conditions including squareness and plumbness. All fire-rated doors to fit with maximum of 1/8” gap. Fabricate doors to fit existing opening. Door openings not meeting these requirements may require and engineering judgement for each varying condition. Furnish setting drawings, templates, and directions for installing hinges, locksets, panic hardware, closers, etc. Deliver such items to Project site in time for installation.

1.5 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification:

1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches (75 by 127 mm).
2. For "Doors" and "Frames" subparagraphs below, prepare Samples approximately 8 by 10 inches (203 by 254 mm) to demonstrate compliance with requirements for quality of materials and construction:

   a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
   b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.

E. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.7 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

B. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Custom Metal Products.
4. Hollow Metal Inc.
5. National Custom Hollow Metal.
6. North American Door Corp.
7. Pioneer Industries, Inc.
8. Republic Doors and Frames.
9. Steelcraft; an Ingersoll-Rand company.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings and temperature-rise limits indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Commercial Doors and Frames: NAAMM-HMMA 861. Provide 18 gauge doors, 16 gauge frames at openings 4'-0" or less in width; 14 gauge frames at openings larger than 4'-0" in width; 14 gauge frames at openings larger than 4'-0" in width. **No knock-down type frames are allowed** except where explicitly indicated as acceptable.

1. Physical Performance: Level A according to SDI A250.4.
2. Doors:

   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches (44.5 mm.)
   c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.042 inch (1.0 mm).
   d. Edge Construction: Continuously welded with no visible seam.
   e. Core: Steel stiffened.

3. Frames:

   a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch (1.3 mm) for door openings 48 inches (1219 mm) or less, or window frames; minimum thickness of 0.067 inch (1.7 mm)for door openings greater than 48 inches (1219 mm).
   b. Construction: Full profile welded.
   c. KD frames are not acceptable.

4. Exposed Finish: Prime.

2.4 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch (1.0 mm) thick, with corrugated or perforated straps not less than 2 inches (51 mm) wide by 10 inches (254 mm) long; or wire anchors not less than 0.177 inch (4.5 mm) thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch- (9.5-mm-) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (51-mm) height adjustment. Terminate bottom of frames at finish floor surface.

2.5 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

G. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

H. Grout: ASTM C 476, except with a maximum slump of 4 inches (102 mm), as measured according to ASTM C 143/C 143M.

I. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

J. Glazing: Comply with requirements in Section 088000 "Glazing."

K. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.6 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Sidelight Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
5. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 16 inches (406 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c., to match coursing, and as follows:

        1) Two anchors per jamb up to 60 inches (1524 mm) high.
        2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
        3) Four anchors per jamb from 90 to 120 inches (2286 to 3048 mm) high.
        4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 120 inches (3048 mm) high.

    b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:

        1) Three anchors per jamb up to 60 inches (1524 mm) high.
        2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) high.
        3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) high.
        4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof above 96 inches (2438 mm) high.
6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

7. Terminated Stops: Terminate stops 6 inches (152 mm) above finish floor with a 45 degree angle cut, and close open end of stop with steel sheet closure. Cover opening in extension of frame with welded-steel filler plate, with welds ground smooth and flush with frame.

C. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

D. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

E. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.7 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

B. Factory Finish: Clean, pretreat, and apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, complying with SDI A250.3.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

2.8 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch (0.4 mm) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Solidly pack mineral-fiber insulation inside frames.
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
5. Concrete Walls: Solidly fill space between frames and concrete with mineral-fiber insulation.
6. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
8. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.

F. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

3.5 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 08 11 13

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SECTION 08 14 16 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including the General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
   1. Division 6 Section "Finish Carpentry"
   2. Division 8 Section “Hollow Metal Doors and Frames”

1.2 SUMMARY

A. This Section includes the following:
   1. Solid core doors with wood veneer faces.
   2. Factory finishing of flush wood doors.
   3. Factory fitting flush wood doors to frames and factory machining for hardware.
   4. Louvers for flush wood doors.

1.3 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

B. Product data for each type of door, including details of core and edge construction, trim for openings, and factory-finishing specifications.

C. Shop drawings indicating location and size of each door, elevation of each kind of door, details of construction, location and extent of hardware blocking, fire ratings, requirements for veneer matching and factory finishing and other pertinent data.
   1. For factory-machined doors, indicate dimensions and locations of cutouts for locksets and other cutouts adjacent to light openings.

D. Samples for initial selection in the form of color charts consisting of actual materials in small sections for the following:
   1. Faces of factory-finished doors with transparent finish. Show the full range of colors available for stained finishes.

E. Samples for verification in the form and size indicated below:
   1. Corner sections of doors approximately 12 inches square with door faces and edgings representing the typical range of color and grain for each species of veneer and solid lumber required. Finish sample with same materials proposed for factory-finished doors.
   2. Frames for light openings, 6 inches long, for each material, type, and finish required.

1.4 QUALITY ASSURANCE

A. Quality Standard: Comply with the following standard:
   1. AWI Quality Standard: "Architectural Woodwork Quality Standards" of the Architectural Woodwork Institute for grade of door, core, construction, finish, and other requirements.

B. Fire-Rated Wood Doors: Provide wood doors that comply with NFPA 80; are identical in materials and construction to units tested in door and frame assemblies per ASTM E 152; and are labeled and listed by UL, Warnock Hersey, or another testing and inspection agency acceptable to authorities having jurisdiction.

C. Single-Source Responsibility: Obtain doors from one source and by a single manufacturer.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect doors during transit, storage, and handling to prevent damage, soiling, and deterioration. Comply with requirements of referenced standard and manufacturer's instructions.

B. Identify each door with individual opening numbers as designated on shop drawings, using temporary, removable, or concealed markings.

1.6 PROJECT CONDITIONS

A. Conditioning: Do not deliver or install doors until conditions for temperature and relative humidity have been stabilized and will be maintained in storage and installation areas during the remainder of the construction period to comply with the following requirements applicable to Project's geographical location:
   1. AWI quality standard Section 100-S-11 "Relative Humidity and Moisture Content."

1.7 WARRANTY

A. General Warranty: Door manufacturer's warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Door Manufacturer's Warranty: Submit written agreement on door manufacturer's standard form signed by manufacturer, Installer, and Contractor, agreeing to repair or replace defective doors that have warped (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section or that show telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span, or do not conform to tolerance limitations of referenced quality standards.

   1. Warranty shall be in effect during the following period of time after date of Substantial Completion.
      a. Solid Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering doors that may be incorporated in the Work include, but are not limited to, the following:
   1. Solid Core Doors:
      a. Algoma Hardwoods Inc.
      b. Buell Door Co.
      c. Eggers Industries, Architectural Door Division.
      d. Graham Manufacturing Corp.
      e. Haley Brothers, Inc.
      f. Ideal Wood Products, Inc.
      g. IPIK Door Co., Inc.
      h. Mohawk Flush Doors, Inc.
      i. Ragland Manufacturing Co., Inc.
      j. V-T Industries Inc.
      k. Weyerhauser Co.

2.2 INTERIOR FLUSH WOOD DOORS

A. Solid Core Doors for transparent stained Finish: Comply with the following requirements:
   1. Faces: Rotary Natural Birch.
   2. Grade: Premium.
   3. Construction: 5 plies.
   4. Core: Particleboard ANSI A208.1, GRADE LD-2 – PC-5 ME. Provide wood blocking in particleboard core doors as needed to eliminate through-bolting hardware. 5” toprail on doors and closers..
   5. Bonding: Stiles and rails bonded to core, then entire unit abrasive planed before veneering.

2.3 VENEER MATCHING

A. Within Door Faces: Provide doors with the following veneer matching:
   1. Book matching.

B. Pairs and Sets: Provide pair matching and set matching for pairs of doors and for doors hung in adjacent sets.

C. Doors with Transoms (if any): Provide the following matching:
   1. Continuous matching.

2.4 FABRICATION

A. Fabricate flush wood doors to comply with following requirements:
   1. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels:
      a. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements of NFPA 80 for fire-resistance-rated doors.

2. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame shop drawings, DHI A115-W series standards, and hardware templates.
   a. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before proceeding with factory machining.
   b. Metal Astragals: Premachine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

B. Transom and Side Panels (if any): Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors.
   1. Fixed Transom Panels (if any): Fabricate fixed panels with solid lumber transom bottom rail and door top rail, both rabbeted as indicated. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.

C. Openings (if any): Cut and trim openings through doors to comply with applicable requirements of referenced standards for kind(s) of door(s) required.
   1. Light Openings: Trim openings with moldings of material and profile indicated.

2.5 FACTORY FINISHING

A. General: Comply with referenced quality standard's requirements for factory finishing.

B. Finish wood doors at factory.

C. Transparent Finish: Comply with requirements indicated for grade, finish system, staining effect, and sheen.
   1. Grade: Premium.
   2. Finish: Manufacturer's standard finish with performance requirements comparable to either AWI System TR-6 catalyzed polyurethane.
   3. Staining: As selected from manufacturer’s full line of standard stain colors.
   4. Effect: Filled finish.
   5. Sheen: Satin.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine installed door frames prior to hanging door:
   1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with plumb jambs and level heads.
   2. Reject doors with defects.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation see Division 8 Section "Door Hardware."

B. Manufacturer's Instructions: Install wood doors to comply with manufacturer's instructions and referenced quality standard and as indicated.
   1. Install fire-rated doors in corresponding fire-rated frames according to requirements of NFPA 80.
   2. Fitting Clearances for Non-Fire-Rated Doors: Provide 1/8 inch at jambs and heads, 1/16 inch per leaf at meeting stiles for pairs of doors, and 1/8 inch from bottom of door to top of decorative floor finish or covering. Where threshold is shown or scheduled, provide 1/4-inch clearance from bottom of door to top of threshold.
   3. Fitting Clearances for Fire-Rated Doors: Comply with NFPA 80.
   4. Bevel non-fire-rated doors 1/8 inch in 2 inches at lock and hinge edges.
   5. Bevel fire-rated doors 1/8 inch in 2 inches on lock edge; trim stiles and rails only to extent permitted by labeling agency.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation, if fitting or machining is required at the job site.

3.3 ADJUSTING AND PROTECTION

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Refinish or replace doors damaged during installation.

C. Protect doors as recommended by door manufacturer to ensure that wood doors will be without damage or deterioration at the time of Substantial Completion.

END OF SECTION 08 14 16

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SECTION 08 31 13 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work performed under this Section includes the performance criteria, materials, production, and erection of access doors and frames for the project and consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all access door work as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction including, but not limited to the following:

1. Access doors and frames for walls and ceilings.
2. Floor access doors and frames.

B. Related Requirements:
1. Division 22 “Plumbing” for plumbing devices that require access.
2. Division 23 “Mechanical” for HVAC devices that require access.
3. Division 26 “Electrical” for Electrical devices that require access.
4. Division 28 “Electronic Safety and Security” for safety and security devices that require access.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings:

1. Include plans, elevations, sections, details, substrates and attachments to other work.
2. Detail fabrication and installation of access doors and frames for each type of substrate.

C. Samples: For each door face material, at least 3 by 5 inches (75 by 125 mm) in size, in specified finish.

D. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

E. Ceiling Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling mounted items including access doors and frames, lighting fixtures, diffusers, grilles, speakers, sprinklers, and special trim are shown and coordinated with each other.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics according to the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:

1. NFPA 252 or UL 10B for fire-rated access door assemblies installed vertically.
2. NFPA 288 for fire-rated access door assemblies installed horizontally.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Basis-of-Design Product: Subject to compliance with requirements, provide access panels as fabricated by FF Systems Access Panels, Inc. or comparable product by one of the following:

1. Access Panel Solutions.
2. Acudor Products, Inc.
3. Babcock-Davis.
4. J. L. Industries, Elmdor/Stoneman Manufacturing Co.; Div. of Acorn Engineering Co.
5. Larsen's Manufacturing Company.
6. Metropolitan Door Industries Corp.
7. Milcor Inc.

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Aluminum Access Doors with Drywall Inserts **(at all public, occupied spaces)**

1. Basis-of-Design Product: FF Systems Access Panels, Inc., System F2AKL.
2. Assembly Description: Welded aluminum frame with both outer and inner frame of high grade aluminum, with drywall inlay.
3. Locations: Wall and ceiling.
4. Door Size: As indicated
5. Frame Material: Aluminum.
6. Hinges: Manufacturer's standard.
7. Seal: Air/dust seal.
8. Hardware: Cylinder-lock.

D. Hardware:

1. Lock: Cylinder.

2.3 FLOOR ACCESS DOORS AND FRAMES

A. Manufacturers: Subject to compliance with requirements, provide access panels as fabricated by Babcock Davis or comparable product by one of the following:

1. Acudor Products, Inc.
2. Metropolitan Door Industries Corp.
3. Milcor Inc.

B. Floor Doors, General: Equip each door with adjustable counterbalancing springs, heavy-duty hold-open arm that automatically locks door open at 90 degrees, release handle with red vinyl grip that allows for one-handed closure, and recessed lift handle.

C. Aluminum Floor Door: Coordinate with equipment. Extruded-aluminum angle frame with 1/4-inch- (6.4-mm-) thick, 1/8-inch pan recess for carpet or tile; nonwatertight; loading capacity to support 300-lbf/sq. ft. (14.4-kN/sq. m) pedestrian live load.

D. Hardware: Provide the following:

1. Hinges: Heavy-duty, stainless-steel butt hinges with stainless-steel pins.
2. Lock: Manufacturer’s standard.
3. Hardware Material: Manufacturer's standard.

E. Fire-Rating: Provide 2-hour fire rated doors in rated floors.

2.4 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Rolled-Steel Floor Plate: ASTM A 786/A 786M, rolled from plate complying with ASTM A 36/A 36M or ASTM A 283/A 283M, Grade C or D.

C. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

E. Rolled-Stainless-Steel Floor Plate: ASTM A 793, manufacturer's standard finish.

F. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A 666, Type 316. Remove tool and die marks and stretch lines or blend into finish.

G. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T6.

H. Aluminum-Alloy Rolled Tread Plate: ASTM B 632/B 632M, Alloy 6061-T6.

I. Aluminum Sheet: ASTM B 209 (ASTM B 209M), alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of Alloy 5005-H15; with minimum sheet thickness according to ANSI H35.2 (ANSI H35.2M).

J. Frame Anchors: Same type as door face.

K. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.5 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
3. Provide mounting holes in frames for attachment of units to metal or wood framing.
4. Provide mounting holes in frame for attachment of masonry anchors.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.

1. For recessed doors with plaster infill, provide self-furring expanded metal lath attached to door panel.

E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder locks, furnish two keys per lock and key all locks alike.
2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

F. Extruded Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

D. Steel and Metallic-Coated-Steel Finishes:

1. Factory Prime: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.
2. Factory Finish: Immediately after cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat, with a minimum dry-film thickness of 1 mil (0.025 mm) for topcoat.

E. Stainless-Steel Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

a. Run grain of directional finishes with long dimension of each piece.
b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
c. Directional Satin Finish: No. 4.

3. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

F. Aluminum Finishes:

1. Mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

3.4 WASTE MANAGEMENT

A. Coordinate with Section 01 74 23.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 08 31 13

SECTION 08 41 13 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the performance criteria, materials, production, and erection of aluminum framed entrances and storefronts for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all aluminum framed entrances and storefronts as required by the this section, schedules, keynotes and drawings, including, but not limited to the following:

1. Exterior storefront framing.
2. Storefront framing for window walls.
3. Storefront framing for punched openings.
4. Exterior manual-swing entrance doors and door-frame units.

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.

e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

E. Fabrication Sample: Of each vertical-to-horizontal intersection of assemblies, made from 12-inch (300-mm) lengths of full-size components and showing details of the following:

1. Joinery, including concealed welds.
2. Anchorage.
3. Expansion provisions.
4. Glazing.
5. Flashing and drainage.

F. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

G. Delegated-Design Submittal: For aluminum-framed entrances and storefronts indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Preconstruction Laboratory Mockup Testing Submittals:

1. Testing Program: Developed specifically for Project.
2. Test Reports: Prepared by a qualified preconstruction testing agency for each mockup test.
3. Record Drawings: As-built drawings of preconstruction laboratory mockups showing changes made during preconstruction laboratory mockup testing.

B. Qualification Data: For Installer and field testing agency.

C. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

D. Product Test Reports: For aluminum-framed entrances and storefronts, for tests performed by manufacturer and witnessed by a qualified testing agency.

E. Quality-Control Program: Developed specifically for Project, including fabrication and installation, according to recommendations in ASTM C 1401. Include periodic quality-control reports.

F. Source quality-control reports.

G. Field quality-control reports.

H. Sample Warranties: For special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

B. Maintenance Data for Structural Sealant: For structural-sealant-glazed storefront to include in maintenance manuals. Include ASTM C 1401 recommendations for post-installation-phase quality-control program.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

D. Structural-Sealant Glazing: Comply with ASTM C 1401 for design and installation of storefront systems.

E. Quality-control program for structural-sealant-glazed system.

F. Preconstruction sealant testing.

1.8 MOCKUPS

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical wall area as shown on Drawings.
2. Mockups for each form of construction and finish.

3. Testing shall be performed on mockups according to requirements in "Field Quality Control" Article.
4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 WARRANTY

A. Special Warranty: Manufacturer and Installer agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Structural failures including, but not limited to, excessive deflection.
   b. Noise or vibration created by wind and thermal and structural movements.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   d. Water penetration through fixed glazing and framing areas.
   e. Failure of operating components.

2. Warranty Period:
   a. Manufacturer to provide 10 years warranty from date of Substantial Completion.
   b. Installer to provide 2 years warranty from date of Substantial Completion for labor and materials.

B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Deterioration includes, but is not limited to, the following:

   a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
   b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
   c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design aluminum-framed entrances and storefronts.

B. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

C. Structural Loads:

1. Wind Loads: 118 mph, and in compliance with NYS Building Code Section 2404 “Wind, Snow, Seismic, and Dead loads on Glass.”
2. Other Design Loads: As indicated on Drawings.

D. Deflection of Framing Members: At design wind pressure, as follows:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches (4.1 m) and to 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 13 feet 6 inches (4.1 m) or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19.1 mm), whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to 1/360 of clear span or 1/8 inch (3.2 mm), whichever is smaller.

a. Operable Units: Provide a minimum 1/16-inch (1.6-mm) clearance between framing members and operable units.

3. Cantilever Deflection: Where framing members overhang an anchor point, as follows:

a. Perpendicular to Plane of Wall: No greater than 1/240 of clear span plus 1/4 inch (6.35 mm) for spans greater than 11 feet 8-1/4 inches (3.6 m) or 1/175 times span, for spans less than 11 feet 8-1/4 inches (3.6 m).

E. Structural: Test according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:

a. Maximum air leakage of 0.06 cfm/sq. ft. (0.30 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).

2. Entrance Doors:

a. Pair of Doors: Maximum air leakage of 1.0 cfm/sq. ft. (5.08 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).
b. Single Doors: Maximum air leakage of 0.5 cfm/sq. ft. (2.54 L/s per sq. m) at a static-air-pressure differential of 6.24 lbf/sq. ft. (300 Pa).

G. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).

H. Water Penetration under Dynamic Pressure: Test according to AAMA 501.1 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested at dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft. (300 Pa).
2. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters, or water that is drained to exterior.

I. Interstory Drift: Accommodate design displacement of adjacent stories indicated.

1. Design Displacement: As indicated on Drawings.
2. Test Performance: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.4 at design displacement and 1.5 times the design displacement.

J. Seismic Performance: Aluminum-framed entrances and storefronts shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Seismic Drift Causing Glass Fallout: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.6 at design displacement and 1.5 times the design displacement.
2. Vertical Interstory Movement: Complying with criteria for passing based on building occupancy type when tested according to AAMA 501.7 at design displacement and 1.5 times the design displacement.

K. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.38 Btu/sq. ft. x h x deg F (2.55 W/sq. m x K) as determined according to NFRC 100.
2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than 0.35 as determined according to NFRC 200.
3. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 15 as determined according to NFRC 500.

L. Noise Reduction: Test according to ASTM E 90, with ratings determined by ASTM E 1332, as follows.

1. Outdoor-Indoor Transmission Class: Minimum 26.

M. Windborne-Debris Impact Resistance: Pass missile-impact and cyclic-pressure tests when tested according to ASTM E 1886 and testing information in ASTM E 1996 for Wind Zone 5.

1. Large-Missile Test: For glazed openings located within 30 feet (9.1 m) of grade.

N. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
2. Thermal Cycling: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.

a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F (82 deg C).
b. Low Exterior Ambient-Air Temperature: 0 deg F (minus 18 deg C).
c. Interior Ambient-Air Temperature: 75 deg F (24 deg C).

O. Structural-Sealant Joints:

1. Designed to carry gravity loads of glazing.
2. Designed to produce tensile or shear stress of less than 20 psi (138 kPa).

P. Structural Sealant: Capable of withstanding tensile and shear stresses imposed by structural-sealant-glazed storefront system without failing adhesively or cohesively. When tested for preconstruction adhesion and compatibility, cohesive failure of sealant shall occur before adhesive failure.

1. Adhesive failure occurs when sealant pulls away from substrate cleanly, leaving no sealant material behind.
2. Cohesive failure occurs when sealant breaks or tears within itself but does not separate from each substrate because sealant-to-substrate bond strength exceeds sealant's internal strength.

2.2 MANUFACTURERS

A. Basis-of-Design: Subject to compliance with requirements, provide systems that match size and appearance of aluminum windows within the specifications of this section division, Trifab 451T (thermal) Storefront System, as manufactured by Kawneer Company, Inc., or comparable product by one of the following:

1. Architectural Windows.
2. Efco Corporation.
3. CRL – U.S. Aluminum

B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing spandrel panels and venting windows and accessories, from single manufacturer.

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. System Dimensions: 2” x 4 ½” (50.8mm x 114.3 mm).
3. Glazing Plane: Center.
4. Finish: Clear anodized finish.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

   a. Sheet and Plate: ASTM B 209 (ASTM B 209M).
   b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
   c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
   d. Structural Profiles: ASTM B 308/B 308M.

2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.

   a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
   b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
   c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 2-inch overall thickness, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
2. Door Design: Medium or Wide stile. 10” high bottom rail for ADA compliance.
3. Glazing stops and gaskets.
4. Material: extra thick (3/16”)

B. Entrance Door Hardware: Refer to Section 08 71 00 "Door Hardware.”

1. Weather stripping: manufacturer’s standard.
2. All hardware to be surface mounted to facilitate future maintenance.
3. Hardware finishes: As selected by Architect from Manufacture’s full range.

C. Additional requirements:

1. Thresholds: Stainless steel, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (12.7 mm).
2. Opening-Force Requirements:
   a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion[and not more than 15 lbf (67 N) to open the door to its minimum required width].
   b. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.
3. Removable Mullions: BHMA A156.3, extruded aluminum.
   a. When used with panic exit devices, provide removable mullions listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305. Use only mullions that have been tested with exit devices to be used.

2.5 GLAZING

A. Glazing: Comply with Section 08 80 00 "Glazing."

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Glazing Sealants: As recommended by manufacturer.

D. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L.

E. Structural Glazing Sealants: ASTM C 1184, chemically curing silicone formulation that is compatible with system components with which it comes in contact, specifically formulated and tested for use as structural sealant and approved by structural-sealant manufacturer for use in storefront system indicated.

1. Color: As selected by Architect from manufacturer's full range of colors.

F. Weatherseal Sealants: ASTM C 920 for Type S; Grade NS; Class 25; Uses NT, G, A, and O; chemically curing silicone formulation that is compatible with structural sealant and other system components with which it comes in contact; recommended by structural-sealant, weatherseal-sealant, and structural-sealant-glazed storefront manufacturers for this use.

1. Color: Match structural sealant.

2.6 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.
3. Use exposed fasteners with countersunk Phillips screw heads fabricated from 300 series stainless steel.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1 inch (25.4 mm) that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

E. Aluminum sunscreen extrusion profile – to be selected by Architect from Manufacturer's standard profiles. Anchored directly to the vertical or horizontal mullions – refer to Drawings. Color to match storefront and windows.

2.7 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from interior.
6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

H. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

I. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

A. High-Performance Organic Coating Finish: AA-C12C42R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturer's written instructions.

1. Fluoropolymer 3-Coat Coating System: Manufacturer's standard 3-coat, thermocured system composed of specially formulated inhibitive primer, fluoropolymer color coat, and clear fluorocarbon topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight; complying with AAMA 2605

   a. Color and Gloss: Match Architect’s sample of Alucobond Anodic Clear Mica Cool PVDF-2/gloss level-30.
   b. It is the intent that all aluminum framing members on the project shall match in color and gloss.

2.9 SOURCE QUALITY CONTROL

A. Structural Sealant: Perform quality-control procedures complying with ASTM C 1401 recommendations including, but not limited to, assembly material qualification procedures, sealant testing, and assembly fabrication reviews and checks.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

F. Install glazing as specified in Section 088000 "Glazing."

G. Install weatherseal sealant according to Section 07 92 00 "Joint Sealants" and according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

H. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

3.4 ERECTION TOLERANCES

A. Erection Tolerances: Install aluminum-framed entrances and storefronts to comply with the following maximum tolerances:

1. Plumb: 1/8 inch in 10 feet (3.2 mm in 3 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
2. Level: 1/8 inch in 20 feet (3.2 mm in 6 m); 1/4 inch in 40 feet (6.35 mm in 12.2 m).
3. Alignment:

a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2 inch (12.7 mm) wide, limit offset from true alignment to 1/16 inch (1.6 mm).
b. Where surfaces are separated by reveal or protruding element from 1/2 to 1 inch (12.7 to 25.4 mm) wide, limit offset from true alignment to 1/8 inch (3.2 mm).
c. Where surfaces are separated by reveal or protruding element of 1 inch (25.4 mm) wide or more, limit offset from true alignment to 1/4 inch (6 mm).

4. Location: Limit variation from plane to 1/8 inch in 12 feet (3.2 mm in 3.6 m); 1/2 inch (12.7 mm) over total length.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts and mockups.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

a. Perform a minimum of two tests in areas as directed by Architect.
b. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.

C. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C 1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.

1. Test a minimum of three areas on each building facade.
2. Repair installation areas damaged by testing.

D. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.6 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Use parts and supplies that are the same as those used in the manufacture and installation of original equipment.

3.7 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 08 41 13

SECTION 08 80 00 – GLAZING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes glazing for the following products, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Windows.
   2. Vision lites / Interior Borrowed Lites.
   3. Entrances and other doors.

B. Related Sections: The following sections contain requirements that relate to this Section.
   1. Division 06 Section "Rough Carpentry"
   2. Division 07 Section "Joint Sealants"
   3. Division 08 Sections "Aluminum Entrances & Storefronts" and "Flush Wood Doors"

C. This work includes all glazing, with the exception that at the East and West additions, the exterior glazing at windows, storefronts and curtainwalls is installed under separate envelope project.

1.3 DEFINITIONS

A. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

B. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

C. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

D. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems that are produced, fabricated, and installed to withstand normal thermal movement, wind loading, and impact loading (where applicable), without failure including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; and other defects in construction.

B. Glass Design: Glass thicknesses indicated on Drawings are for detailing only. Confirm glass thicknesses by analyzing Project loads and in-service conditions. Provide glass lites for the various size openings in the thicknesses and strengths (annealed or heat-treated) to meet or exceed the following criteria:
   1. Minimum glass thicknesses of lites, whether composed of annealed or heat-treated glass, are selected so the worst-case probability of failure does not exceed the following:
      a. 8 lites per 1000 for lites set vertically or not over 15 degrees off vertical and under wind action. Determine minimum thickness of monolithic annealed glass according to ASTM E 1300. For other than monolithic annealed glass, determine thickness per glass manufacturer's standard method of analysis including applying adjustment factors to ASTM E 1300 based on type of glass.

C. Normal thermal movement results from the following maximum change (range) in ambient and surface temperatures acting on glass-framing members and glazing components. Base engineering calculation on materials' actual surface temperatures due to both solar heat gain and nighttime sky heat loss.
   1. Temperature Change (Range): 120 F deg, ambient; 180 F deg, material surfaces.

1.5 SUBMITTALS

A. General: Submit the following according to Conditions of Contract and Division 1 Specification Sections.

B. Product data for each glass product and glazing material indicated.

C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

D. Samples for verification purposes of 12-inch square samples of each type of glass indicated except for clear monolithic glass products, and 12-inch long samples of each color required (except black) for each type of sealant or gasket exposed to view. Install sealant or gasket sample between two strips of material representative in color of the adjoining framing system.

E. Product certificates signed by glazing materials manufacturers certifying that their products comply with specified requirements.
   1. Separate certifications are not required for glazing materials bearing manufacturer's permanent labels designating type and thickness of glass, provided labels represent a quality control program of a recognized certification agency or independent testing agency acceptable to authorities having jurisdiction.

F. Compatibility and adhesion test reports from sealant manufacturer indicating that glazing materials were tested for compatibility and adhesion with glazing sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed for adhesion.

G. Compatibility test report from manufacturer of insulating glass edge sealant indicating that glass edge sealants were tested for compatibility with other glazing materials including sealants, glazing tape, gaskets, setting blocks, and edge blocks.

H. Product test reports for each type of glazing sealant and gasket indicated, evidencing compliance with requirements specified.

I. Maintenance data for glass and other glazing materials to include in Operating and Maintenance Manual specified in Division 1.

1.6 QUALITY ASSURANCE

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, except where more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
   1. FGMA Publications: "FGMA Glazing Manual."
   2. SIGMA Publications: TM-3000 "Vertical Glazing Guidelines."

B. Safety Glass: Products complying with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for Category II materials.
   1. Subject to compliance with requirements, provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction.

C. Fire-Resistive Glazing Products for Door Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing to NFPA 257.

D. Fire-Resistive Glazing Products for Window Assemblies: Glazing for assemblies that comply with NFPA 80 and that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing to NFPA 257.

E. Safety Glazing Products: Comply with testing requirements in 16CFR 1201
   1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency acceptable to authorities having jurisdiction.
   2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft (0.84 sq. m) in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft (0.84 sq. m) or less in exposed surface area on one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

F. Insulating Glass Certification Program: Provide insulating glass units permanently marked either on spacers or at least one component lite of units with appropriate certification label of inspecting and testing agency indicated below:
   1. Insulating Glass Certification Council (IGCC).
   2. Associated Laboratories, Inc. (ALI).
   3. National Certified Testing Laboratories (NCTL).

G. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar in material, design, and extent to that indicated for Project with a record of successful in-service performance.

H. Single-Source Responsibility for Glass: Obtain glass from one source for each product indicated below:

1. Primary glass of each (ASTM C 1036) type and class indicated.
2. Heat-treated glass of each (ASTM C 1048) condition indicated.
3. Insulating glass of each construction indicated.
4. Fire resistive glass (ASTM E119) of each type and class indicated.

I. Single-Source Responsibility for Glazing Accessories: Obtain glazing accessories from one source for each product and installation method indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Where insulating glass units will be exposed to substantial altitude changes, comply with insulating glass fabricator's recommendations for venting and sealing to avoid hermetic seal ruptures.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F (4.4 deg C).

1.9 WARRANTY

A. General: Warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

B. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: 10 years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form in which laminated-glass manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: 10 years from date of Substantial Completion.

D. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS

A. NOTE: ALL GLASS USED SHALL BE SAFETY GLASS MEETING REQUIREMENTS FOR CPSC 16 CFR 1201.

B. Annealed Float Glass: ASTM C 1036, Type I (transparent glass, flat), Class as indicated below, and Quality q3 (glazing select). Minimum ¼ inch thick.
1. Class 1 (clear) unless otherwise indicated.

C. Heat-Treated Float Glass: ASTM C 1048, Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind as indicated below. Minimum ¼ inch thick.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
3. For uncoated glass, comply with requirements for Condition A.
4. For coated vision glass, comply with requirements for Condition C (other uncoated glass).
5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated

D. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), and complying with other requirements specified.

E. Laminated Glass: ASTM C 1172 and complying with testing requirements in 16 CFR 1201 for Category II materials, and with other requirements specified. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
1. Interlayer: Polyvinyl butyral of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation
   a. For polyvinyl butyral interlayers, laminate lites in autoclave with heat and pressure.
2. Laminating process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.

F. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
2. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
3. Sealing System: Dual seal, with primary and secondary sealants as follows:
4. Manufacturer's standard sealants.
   a. Polyisobutylene and polysulfide.
   b. Polyisobutylene and hot-melt butyl.
   c. Polyisobutylene and silicone.
   d. Polyisobutylene and polyurethane
5. Spacer Specifications: Manufacturer's standard spacer material and construction.
6. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:
   a. Spacer Material: Aluminum with clear anodic finish.
   b. Corner Construction: Manufacturer's standard corner construction.
7. Low "E" Glass: Provide nominal 1" insulated glass comprised of inner ¼" pane of clear glass with Low "E" coating, ½" air space, outer ¼" pane of clear glass
8. Winter U-value: .38
9. Solar reflectance: 29%
10. Sealed insulating glass units shall be in conformance to ASTM E 774-92; permanent IGCC certification label for CBA rating level.

2.2 FIRE-RATED GLAZING PRODUCTS

A. Laminated Ceramic Glazing Material: Proprietary Category II safety glazing product in the form of 2 lites of clear ceramic glazing material laminated together to produce a laminated lite of 5/16-inch (8-mm) nominal thickness; polished on both surfaces; weighing 4 lb/sq. ft. (19.5 kg/sq. m); and as follows:
   1. Fire-Protection Rating: As indicated for the assembly in which glazing material is installed, and permanently labeled by a testing and inspecting agency acceptable to authorities having jurisdiction.
   2. Polished on both surfaces, transparent.
   3. Approved products: Fire lite plus premium or approved equal.
   4. Provide glazing resistant to heat rate of rise transfer, compliant with ASTM E 119, where required. Basis of Design: Fire Lite Pyrostop or approved equal.

2.3 GLAZING SEALANTS

A. General:

   1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
   3. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.

B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 790.
b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
c. May National Associates, Inc.; Bondaflex Sil 290.
d. Pecora Corporation; 890.
e. Sika Corporation, Construction Products Division; SikaSil-C990.
f. Tremco Incorporated; Spectrem 1.

2. Applications: For weather seal.

C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 799.
b. GE Advanced Materials - Silicones; UltraGlaze SSG4000
c. May National Associates, Inc.; Bondaflex Sil 200 GPN or Bondaflex Sil 201 FC.
d. Polymeric Systems, Inc.; PSI-631.
e. Schnee-Morehead, Inc., an ITW company; SM5731 Poly-Glaze Plus.
f. Tremco Incorporated; Proglaze SSG or Tremsil 600.

2. Applications: For structural seal.

D. Glazing Sealant: Acid-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 25, Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Corning Corporation; 795.
b. General Electric; Siliglaze-II 2800
c. Tremco Incorporated; Spectrum 2

2. Applications: Fire and Safety Rated Glazing

3. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.4 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with a solids content of 100 percent, nonstaining and nonmigrating in contact with nonporous surfaces, with or without spacer rod as recommended by tape and glass manufacturers for application indicated, packaged on rolls with a release paper backing, and complying with AAMA 800 for products indicated below:

1. AAMA 806.1.

B. Expanded Cellular Glazing Tape: Closed-cell, polyvinyl chloride foam tape, factory coated with adhesive on both surfaces, packaged on rolls with release liner protecting adhesive, and complying with AAMA 800 for product 810.5.

C. Available Products: Subject to compliance with requirements, glazing tape that may be incorporated in the Work include, but is not limited to, the following:
   1. Back-Bedding Mastic Glazing Tape Without Spacer Rod:
      a. Dyna-Seal, Pecora Corp.
      b. PTI 626 Architectural Sealant Tape, Protective Treatments, Inc.
      c. S-M 5710 H.P Poly-Glaze Tape Sealant, Schnee-Morehead, Inc.
      d. SST-800 Tape, Tremco, Inc.
   2. Expanded Cellular Glazing Tape:
      a. Norseal V-980 Closed-Cell Glazing Tape, Norton Company.

2.5 GLAZING GASKETS

A. Lock-Strip Gaskets: Neoprene extrusions in size and shape indicated, fabricated into frames with molded corner units and zipper lock strips, complying with ASTM C 542, black.

B. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:
   1. EPDM, ASTM C 864.
   2. Silicone, ASTM C 1115.
   3. Thermoplastic polyolefin rubber, ASTM C 1115.
   4. Any material indicated above.

C. Soft Compression Gaskets: Extruded or molded closed-cell, integral-skinned gaskets of material indicated below, complying with ASTM C 509, Type II, black, and of profile and hardness required to maintain watertight seal:
   1. EPDM.
   2. Silicone.
   3. Thermoplastic polyolefin rubber.
   4. Any material indicated above.

D. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated in the work include, but are not limited to, the following companies.
   1. Lock-Strip Gaskets:
      a. Stanlock Div., Griffith Rubber Mills.
   2. Preformed Gaskets:
      a. Advanced Elastomer Systems, L.P.
      b. Schnee-Morehead, Inc.
      c. Tremco, Inc.

2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials involved for glazing application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore A durometer hardness of 85 plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side-walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

H. Plastic Foam Joint Fillers: Preformed, compressible, resilient, nonstaining, nonextruding, nonoutgassing, strips of closed-cell plastic foam of density, size, and shape to control sealant depth and otherwise contribute to produce optimum sealant performance.

2.7 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 GLAZING SCHEDULE

A. Type GL1 – 1" Clear Insulated Laminated Glazing Unit, Exterior U.O.N

B. Type GL2 – NOT USED

C. Type GL3 – NOT USED

D. Type GL4 – Clear Laminated, Safety Glass - Interior (U.O.N.)

3.2 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
   1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.

2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

C. Do not proceed with glazing until unsatisfactory conditions have been corrected.

3.3 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.4 GLAZING, GENERAL

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions as indicated on Drawings provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass from edge damage during handling and installation as follows:
1. Use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges so edges are located at top of opening, unless otherwise indicated by manufacturer's label.
2. Remove damaged glass from Project site and legally dispose of off site. Damaged glass is glass with edge damage or other imperfections that, when installed, weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install elastomeric setting blocks in sill rabbets, sized and located to comply with referenced glazing standard, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

3.5 TAPE GLAZING

A. Position tapes on fixed stops so that when compressed by glass their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously but not in one continuous length. Do not stretch tapes to make them fit opening.

C. Where framing joints are vertical, cover these joints by applying tapes to heads and sills first and then to jambs. Where framing joints are horizontal, cover these joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each lite is installed.

F. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

3.6 GASKET GLAZING (DRY)

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with stretch allowance during installation.

B. Secure compression gaskets in place with joints located at corners to compress gaskets producing a weather tight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

C. Install gaskets so they protrude past face of glazing stops.

3.7 SEALANT GLAZING (WET)

A. Install continuous spacers between glass lites and glazing stops to maintain glass face clearances and to prevent sealant from extruding into glass channel weep systems until sealants cure. Secure spacers in place and in position to control depth of installed sealant relative to edge clearance for optimum sealant performance.

B. Force sealants into glazing channels to eliminate voids and to ensure complete wetting or bond of sealant to glass and channel surfaces.

C. Tool exposed surfaces of sealants to provide a substantial wash away from glass. Install pressurized gaskets to protrude slightly out of channel to eliminate dirt and moisture pockets.

3.8 LOCK-STRIP GASKET GLAZING

A. Comply with ASTM C 716 and gasket manufacturer's printed recommendations. Provide supplementary wet seal and weep system unless otherwise indicated.

3.9 CLEANING AND PROTECTION

A. Protect exterior glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations including weld splatter. If, despite such protection, contaminating substances do come into contact with glass, remove them immediately as recommended by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for build-up of dirt, scum, alkali deposits, or stains, and remove as recommended by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

E. Wash glass on both faces in each area of Project not more than 4 days prior to date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended by glass manufacturer.

3.10 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.
   1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
   2. Set aside and protect materials suitable for reuse and/or remanufacturing.
   3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 08 80 00

SECTION 08 83 00 - MIRRORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work performed under this Section includes the performance criteria, materials, production, and erection of Mirrors for the project and consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all Mirrors as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction including, but not limited to the following:

1. Tempered glass mirrors qualifying as safety glazing.

B. Related Sections:

1. Division 08 "Glazing" for glass with reflective coatings used for vision and spandrel lites.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1. Mirrors. Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.

B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.

C. Samples: For each type of the following products:

1. Mirrors: 12 inches (300 mm) square, including edge treatment on two adjoining edges.
2. Mirror Clips: Full size.
3. Mirror Trim: 12 inches (300 mm) long.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each type of mirror and mirror mastic, from manufacturer.

C. Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing film and substrates on which mirrors are installed.

D. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For mirrors to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

B. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.

C. Source Limitations for Mirror Accessories: Obtain mirror glazing accessories from single source.

D. Glazing Publications: Comply with the following published recommendations:

1. GANA's "Glazing Manual" unless more stringent requirements are indicated. Refer to this publication for definitions of glass and glazing terms not otherwise defined in this Section or in referenced standards.
2. GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors."

E. Safety Glazing Products: For tempered mirrors, provide products complying with testing requirements in 16 CFR 1201 for Category II materials.

F. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing film and substrates on which mirrors are installed.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

B. Mirror shall be installed flush with tile.

1.9 WARRANTY

A. Special Warranty: Manufacturer's standard form in which mirror manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SILVERED FLAT GLASS MIRRORS

A. Refer to Restroom and Accessory Schedule for toilet room mirror bases of design.

B. Where mirror product is not specifically noted otherwise, furnish and install glass Mirrors, General: ASTM C 1503**;** manufactured using copper-free, low-lead mirror coating process.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Arch Aluminum & Glass Co., Inc.
b. Donisi Mirror Company.
c. Gardner Glass, Inc.
d. Guardian Industries.
e. Independent Mirror Industries, Inc.
f. Lenoir Mirror Company. National Glass Industries.
g. Stroupe Mirror Co., Inc.
h. Sunshine Mirror; Westshore Glass Corp.
i. Virginia Mirror Company, Inc.
j. Walker Glass Co., Ltd.

C. Tempered Clear Glass: Mirror Glazing Quality, for blemish requirements; and comply with ASTM C 1048 for Kind FT, Condition A, tempered float glass before silver coating is applied.

1. Nominal Thickness: 6.0 mm.

2.2 MISCELLANEOUS MATERIALS

A. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

B. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

C. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Franklin International; Titebond Division.
b. Laurence, C. R. Co., Inc.
c. Macco Adhesives; Liquid Nails Division.
d. OSI Sealants, Inc.
e. Palmer Products Corporation.
f. Pecora Corporation.
g. Royal Adhesives & Sealants; Gunther Mirror Mastics Division.
h. Sommer & Maca Industries, Inc.

2. Adhesive shall have a VOC content of not more than 70 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.

2.3 MIRROR HARDWARE

A. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover bottom and top edges of each mirror in a single piece.

1. Bottom Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch (9.5 and 22 mm) in height, respectively, and a thickness of not less than 0.05 inch (1.3 mm).

a. Products: Subject to compliance with requirements, provide one of the following:

1) Laurence, C. R. Co., Inc.; CRL Standard "J" Channel.
2) Sommer & Maca Industries, Inc.; Aluminum Shallow Nose "J" Moulding Lower Bar.
3) Sommer & Maca Industries, Inc.; Heavy Gauge Aluminum Shallow Nose "J" Moulding Lower Bar.

2. Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch (16 and 25 mm) in height, respectively, and a thickness of not less than 0.062 inch (1.57 mm).

a. Products: Subject to compliance with requirements, provide one of the following:

1) Laurence, C. R. Co., Inc.; CRL Deep "J" Channel.
2) Sommer & Maca Industries, Inc.; Aluminum Deep Nose "J" Moulding Upper Bar.
3) Sommer & Maca Industries, Inc.; Heavy Gauge Aluminum Deep Nose "J" Moulding Lower Bar.

3. Finish: Clear bright anodized.

B. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.

C. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.

2.4 FABRICATION

A. Mirror Sizes: To suit Project conditions, and before tempering, cut mirrors to final sizes and shapes.

B. Cutouts: Fabricate cutouts before tempering for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts so they fit closely around penetrations in mirrors.

C. Mirror Edge Treatment: Rounded polished.

1. Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.
2. Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

D. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint as recommended in writing by film-backing manufacturer to produce a surface free of bubbles, blisters, and other imperfections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.

B. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.

C. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.

3.2 PREPARATION

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.

3.3 INSTALLATION

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

B. Mirrors shall be installed flush with face of tile.

C. Provide a minimum air space of 1/8 inch (3 mm) between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

D. Wall-Mounted Mirrors: Install mirrors with mastic and mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

1. Top and Bottom Aluminum J-Channels: Provide setting blocks 1/8 inch (3 mm) thick by 4 inches (100 mm) long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch (6.4 mm) wide by 3/8 inch (9.5 mm) long at bottom channel.
2. Install mastic as follows:

   a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
   b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.
   c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 inch (3 mm) between back of mirrors and mounting surface.

3.4 CLEANING AND PROTECTION

A. Protect mirrors from breakage and contaminating substances resulting from construction operations.

B. Do not permit edges of mirrors to be exposed to standing water.

C. Maintain environmental conditions that will prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

D. Wash exposed surface of mirrors not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash mirrors as recommended in writing by mirror manufacturer.

3.5 WASTE MANAGEMENT

A. Coordinate with Division 01.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area

END OF SECTION 08 83 00

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SECTION 08 90 00 - LOUVERS AND VENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Adjustable, extruded-aluminum louvers.

B. Related Sections:
   1. Division 09 Section "Exterior Painting" for field painting louvers.
   2. Division 23 Sections for louvers that are a part of mechanical equipment.
   3. Division 23 Section "Instrumentation and Control for HVAC" for electric, electronic, and pneumatic control of adjustable louvers.
   4. Division 26 Sections for electrical power connections for motor-operated adjustable louvers.

1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are horizontal.

C. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

D. Storm-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural performance requirements and design criteria indicated.

   Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.

1. Wind Loads: Determine loads based on a uniform pressure of **20 lbf/sq. ft. (957 Pa)**, acting inward or outward.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.

1. Temperature Change (Range): **120 deg F (67 deg C), ambient; 180 deg F (100 deg C)** material surfaces.

C. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
2. Show mullion profiles and locations.
3. Wiring Diagrams: For power, signal, and control wiring for motorized adjustable louvers.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Samples for Verification: For each type of metal finish required.

E. Delegated-Design Submittal: For louvers indicated to comply with structural performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Product Test Reports: Based on evaluation of comprehensive tests performed according to AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain louvers and vents from single source from a single manufacturer where indicated to be of same type, design, or factory-applied color finish.

B. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."
3. AWS D1.6, "Structural Welding Code - Stainless Steel."

C. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

D. UL and NEMA Compliance: Provide motors and related components for motor-operated louvers that are listed and labeled by UL and comply with applicable NEMA standards.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.

B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Aluminum Castings: ASTM B 26/B 26M, Alloy 319.

D. Fasteners: Use types and sizes to suit unit installation conditions.

1. Use **hex-head or Phillips pan-head** screws for exposed fasteners unless otherwise indicated.
2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
3. For color-finished louvers, use fasteners with heads that match color of louvers.

E. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.2 FABRICATION, GENERAL

A. Assemble louvers in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.

1. Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern **unless horizontal mullions are indicated**.
2. Horizontal Mullions: Provide horizontal mullions at joints **unless continuous vertical assemblies are indicated**.

C. Maintain equal louver blade spacing**, including separation between blades and frames at head and sill,** to produce uniform appearance.

D. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

1. Frame Type: **Interior flange** unless otherwise indicated.

E. Include supports, anchorages, and accessories required for complete assembly.

F. Provide vertical mullions of type and at spacings indicated, but not more than recommended by manufacturer, or 72 inches (1830 mm) o.c., whichever is less.

1. Fully Recessed Mullions: Where indicated, provide mullions fully recessed behind louver blades. Where length of louver exceeds fabrication and handling limitations, fabricate with close-fitting blade splices designed to permit expansion and contraction.
2. Exterior Corners: Prefabricated corner units with mitered **blades with concealed close-fitting splices** and with **fully recessed** mullions at corners.

G. Provide **subsills made of same material as louvers** for recessed louvers.

H. Join frame members to each other and to fixed louver blades with fillet **welds, threaded fasteners, or both, as standard with louver manufacturer** unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

2.3 ADJUSTABLE, EXTRUDED-ALUMINUM LOUVERS

A. Louver Construction and Operation: Provide adjustable louvers with extruded-aluminum frames and blades not less than 0.080-inch (2.03-mm) nominal thickness, and with operating mechanisms to suit louver sizes.

1. Hand operation with push bars.
2. Crank operation with removable-crank operator in sill or jamb.
3. Chain operation with tension spring, wall clip, pull chain, and 160 deg F (71 deg C) fusible link.
4. Motor operation with **terminals for controlling devices**.

B. Dual-Blade, Drainable-Blade, Adjustable Louver **LV-1 through LV-4**: Fixed drainable blades and adjustable plain blades combined in single frame.

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following:**

2. Basis-of-Design Product:Subject to compliance with requirements, provide or comparable product by one of the following:

   a. Air Balance Inc.; a Mestek company.
   b. Greenheck Fan Corporation.
   c. Ruskin Company; Tomkins PLC.

3. Louver Depth: **6 inches (150 mm)**, overall.
4. Louver Performance Ratings:

   a. Free Area: Not less than **6.0 sq. ft. (0.56 sq. m)**
   b. Point of Beginning Water Penetration: Not less than **750 fpm (3.8 m/s)**
   c. Air Performance: Not more than **0.10-inch wg (25-Pa)** static pressure drop at **750-fpm (3.8-m/s)** free-area **intake** velocity.
   d. Air Leakage: Not more than **1.5 cfm/sq. ft. (7.6 L/s per sq. m**louver gross area at a differential static pressure of 0.15-inch wg (37 Pa) with adjustable louver blades closed.

5. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

2.4 LOUVER SCREENS

A. General: Provide screen at **each exterior louver**.

   1. Screen Location for Fixed Louvers: Interior face.
   2. Screen Location for Adjustable Louvers: **Interior** face unless otherwise indicated.
   3. Screening Type: **Bird screening**.

B. Secure screen frames to louver frames with **machine screws with heads finished to match louver**, spaced a maximum of 6 inches (150 mm) from each corner and at 12 inches (300 mm) o.c.

C. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

   1. Metal: Same kind and form of metal as indicated for louver to which screens are attached.

   2. Finish: **Same finish as louver frames to which louver screens are attached**.
   3. Type: **Rewirable frames with a driven spline or insert**.

D. Louver Screening for Aluminum Louvers:

   1. Bird Screening: Aluminum, 1/2-inch- (13-mm-) square mesh, 0.063-inch (1.60-mm) wire.

2.5 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

2.6 ALUMINUM FINISHES

A. Finish louvers after assembly.

B. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: **As selected by Architect from manufacturer's full range**

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.

3.3 INSTALLATION

A. Locate and place louvers and vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

F. Protect unpainted galvanized and nonferrous-metal surfaces that will be in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

G. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Division 07 Section "Joint Sealants" for sealants applied during louver installation.

3.4 ADJUSTING AND CLEANING

A. Test operation of adjustable louvers and adjust as needed to produce fully functioning units that comply with requirements.

B. Clean exposed surfaces of louvers and vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.

C. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

D. Restore louvers and vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 08 90 00

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SECTION 09 01 20 – PATCHING LARGE HOLES IN PLASTER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The procedures include general guidelines offered by GSA (US Government Services Administration) to follow when restoring plaster in historic buildings. It identifies specific design issues and outlines recommended installation solutions that have the least visual or physical impact on the historic materials. This procedure includes guidance on repair of large plaster holes greater than 4-inches in diameter. When larger sections of plaster are missing, drywall patches may be used as a base.

B. Related Requirements:
   1. Division 09: Gypsum Plaster, Restoring Small Plaster Holes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

B. Sustainable Submittals:

C. Product Data: for adhesives, documentation including printed statement of VOC content.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports:
   1. Expansion anchors.
   2. Metal framing anchors.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect materials from weather in waterproof enclosure. Provide for air circulation around materials.

1.6 QUALITY ASSURANCE

A. These guidelines should be reviewed prior to performing this procedure and should be followed, when applicable, along with recommendations from the State Historic Preservation Officer (SHPO).

PART 2 - PRODUCTS

2.1 MATERIALS

A. Drywall and joint compound

B. Nails and screws

C. Joint tape (cloth mesh preferred)

2.2 EQUIPMENT

A. 6-inch taping knife

B. 12-inch taping knife

C. Float

D. Hawk

E. Sanding sponge (medium fine grit)

F. Stiff putty knife

G. Goggles, work gloves, and dust mask

H. Hammer and cold chisel

I. Needle nose pliers and wire cutter

J. Screw gun and drill

K. Spray bottle and drop cloths

L. Tin snips

M. Vacuum

PART 3 - EXECUTION

3.1 EXAMINATION

A. Determine the extent of damaged plaster. Look for:
   1. Holes.
   2. Water Stains: Brownish rings on the plaster, especially the ceilings, indicate that the plaster has been wet. If the water was stopped quickly, the surface may only need to be sealed with pigmented shellac to prevent the stain from bleeding through the new paint or wallpaper. However, if the leak continued for a long period, the plaster will need to be replaced, and will often have a powdery appearance.
   3. Chipping, flaking and delamination of plaster due to water infiltration.

3.2 EXECUTION / INSTALLATION / APPLICATION

A. Removing Deteriorated Plaster:
   1. Remove loose plaster from the walls by hand (or flat prybar may also be helpful in removing plaster that is difficult to remove by hand).
   2. To remove sound plaster, for whatever reason, drill holes in the line of cut with a carbide drill bit; Holding the chisel at a shallow angle, carefully cut directly from hole to hole with a cold chisel; Cut the resulting plaster free from the lath by chipping the keys from the side.
   3. Cut the plaster back to the nearest studs to make a regular opening, and re-secure the lath with drywall nails.
   4. Use plaster washers and wood screws to re-secure weakly-keyed areas of sound plaster to the wall or ceiling.
   5. Knock any plaster stuck between the lath back into the wall cavity.

6. Vacuum all dust, loose plaster, and other debris from the hole with a shop-vac, or sweep it out with an old paintbrush.

B. Making a Sheetrock Patch

1. Shim the Sheetrock as required to bring it up flush with the surface of the adjacent plaster.
2. Cut a Sheetrock patch to fit neatly in the opening.
3. Nail or screw the sheetrock in place; nail heads or screw heads should be set slightly below the surface of the Sheetrock, but without breaking the paper.
4. Using the 6-inch taping knife, fill the joint between the Sheetrock and the plaster with a small amount of joint compound.
5. Apply a fairly smooth, heavy coat of compound over the joint a little wider than the tape width.
6. Center the joint tape over the length of the joint; Hold the 6-inch taping knife at a 45-degree angle and press the tape into the compound; Smooth out any air pockets under the tape.
7. Apply a thin layer of compound over the tape and apply a first coat of compound to nails or screws.
8. Knock off any ridges or pimples that develop from shrinkage and cracking in the compound.
9. Apply the second coat of compound with the 6-inch taping knife and feather the edges out 6-8 inches; Scrape off any ridges or bumps.
10. When the second coat is dry, apply the third coat of compound with the 12-inch taping knife and feather the edges out 12-14 inches.
11. Touch up low spots with additional compound or high spots by light sanding with a wet sanding sponge.

3.3 WASTE MANAGEMENT

A. Coordinate with Division 01.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 09 01 20

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SECTION 09 01 23 – PATCHING SMALL HOLES & CRACKS IN PLASTER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The procedures include general guidelines offered by GSA (US Government Services Administration) to follow when restoring plaster in historic buildings. It identifies specific design issues and outlines recommended installation solutions that have the least visual or physical impact on the historic materials. This procedure includes guidance on repair of patching small chips, cracks or depressions in plaster surfaces.

B. Related Requirements:
   1. Division 09: Gypsum Plaster, Restoring Large Plaster Holes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product.

B. Sustainable Submittals:

C. Product Data: for adhesives, documentation including printed statement of VOC content.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports:
   1. Expansion anchors.
   2. Metal framing anchors.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect materials from weather in waterproof enclosure. Provide for air circulation around materials.

1.6 QUALITY ASSURANCE

A. These guidelines should be reviewed prior to performing this procedure and should be followed, when applicable, along with recommendations from the local preservation office or State Historic Preservation Officer (SHPO).

1.7 REFERENCES

A. American National Standards Institute (ANSI) Standard Specifications: ANSI, 1430 Broadway, New York, NY 10018.

B. American Society for Testing and Materials (ASTM) Standard Specifications: ASTM, 1916 Race Street, Philadelphia, PA 19103-1187, 215/299-5400.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. U.S. Gypsum Association 810 First Street NE, #510 Washington, DC 20002 202/289-5440, FAX 202/289-3707

2.2 MATERIALS

A. Gypsum Plaster Materials:
   1. General: gypsum plastering materials shall conform to ANSI A42.1. Provide neat or ready-mixed materials at installer's option unless indicated otherwise.
   2. Base coat plaster: Perlite gypsum plaster such as" Structo-Lite" (U.S. Gypsum Association), or approved equal.
   3. Base coat aggregate: Sand.
   4. Finish coat plaster: Keene's cement.
   5. Finishing lime: Installer's option for type.

B. Bonding Materials: Bonding agent shall conform to ASTM C631.

2.3 EQUIPMENT

A. Joint knife

B. Sponge or heavy-nap cloth

C. Crack widener or triangular can opener

D. Stiff bristle brushes

E. Hawk

F. Slicker (flexible straight-edge)

G. Plasterer's trowel

H. Margin trowel

I. Mortarboard and mud pan

J. Pointing trowel

PART 3 - EXECUTION

3.1 EXECUTION, INSTALLATION, APPLICATION

A. Scrape loose or damaged finish plaster and peeling paint from surface with chisel or joint knife. Remove material where required to enlarge cracks, chips, holes, etc. to at least 1/2 inch across and undercut to improve bonding of new material.

B. Brush or vacuum surface to remove dust and debris.

C. Moisten the surface by lightly spraying a fine mist of clean water from a spray bottle.

D. Apply skim finish coat over low areas to bring entire finished surface out flush with the projecting firm and sound layers of adjacent plaster or paint. Form plaster as required to match original configuration and design or ornamental plaster.

E. Once dry, sand by hand to produce a surface without bumps, cracks or depressions, ready to receive finish treatment.

3.2 ADJUSTING/CLEANING

A. Upon completion of this work, all floors, walls and other adjacent surfaces that are stained, marred, or otherwise damaged by work in this procedure shall be cleaned and repaired and all work and the adjacent areas shall be left in a clean and perfect condition.

B. All completed work shall be adequately protected from damage by subsequent building operations and effects of weather. Protection shall be by methods recommended by the manufacturer of installed materials and as approved by Architect.

3.3 WASTE MANAGEMENT

A. Coordinate with Division 01.
   1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
   2. Set aside and protect materials suitable for reuse and/or remanufacturing.
   3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area

END OF SECTION 09 01 23

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SECTION 09 21 16 - GYPSUM BOARD SHAFT WALL ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the performance criteria, materials, production, and erection of gypsum board shaft wall assemblies for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all gypsum board shaft wall assemblies as required by this section, schedules, keynotes and drawings.

1.3 ACTION SUBMITTALS

A. Product Data: For each component of gypsum board shaft wall assembly.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For shaft wall assemblies and firestop tracks, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.6 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or with gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: Provide materials and construction identical to those of assemblies tested according to ASTM E 90 and classified according to ASTM E 413 by a testing and inspecting agency.

2.2 GYPSUM BOARD SHAFT WALL ASSEMBLIES

A. Fire-Resistance Rating: As indicated.

B. STC Rating: As indicated.

C. Studs: Manufacturer's standard profile for repetitive members, corner and end members, and fire-resistance-rated assembly indicated.

1. Depth: As indicated.
2. Minimum Base-Metal Thickness: As indicated per UL Listing.

D. Runner Tracks: Manufacturer's standard J-profile track with manufacturer's standard long-leg length, but at least 2 inches (51 mm) long and matching studs in depth.

1. Minimum Base-Metal Thickness: Matching steel studs or as indicated.

E. Firestop Tracks: Provide firestop track at head of shaft wall on each floor level.

F. Elevator Hoistway Entrances: Manufacturer's standard J-profile jamb strut with long-leg length of 3 inches (76 mm), matching studs in depth, and not less than 0.033 inch (0.84 mm) thick.

G. Room-Side Finish: As indicated.

H. Shaft-Side Finish: As indicated by fire-resistance-rated assembly design designation.

I. Insulation: Sound attenuation blankets.

2.3 PANEL PRODUCTS

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

B. Gypsum Shaftliner Board, Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with paper faces.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. American Gypsum; Shaft Liner.
   b. CertainTeed Corp.; ProRoc Shaftliner.
   c. Georgia-Pacific Gypsum LLC, Subsidiary of Georgia Pacific; ToughRock Fireguard Shaftliner.
   d. National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner.
   e. USG Corporation; Sheetrock Brand Gypsum Liner Panel.

2. Thickness: 1 inch (25.4 mm).
3. Long Edges: Double bevel.

C. Gypsum Shaftliner Board, Moisture- and Mold-Resistant Type X: ASTM C 1396/C 1396M; manufacturer's proprietary fire-resistive liner panels with moisture- and mold-resistant core and surfaces.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. CertainTeed Corp.; ProRoc Moisture and Mold Resistant Shaftliner.
   b. Georgia-Pacific Gypsum LLC, Subsidiary of Georgia Pacific; Dens-Glass Ultra Shaftliner.
   c. National Gypsum Company; Gold Bond Brand Fire-Shield Shaftliner XP.
   d. USG Corporation; Sheetrock Brand Mold Tough Gypsum Liner Panel.

2. Thickness: 1 inch (25.4 mm).
3. Long Edges: Double bevel.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

D. Gypsum Board: As specified in Section 09 29 00 "Gypsum Board."

E. Cementitious Backer Units: As specified in Division 09.

2.4 NON-LOAD-BEARING STEEL FRAMING

A. Steel Framing Members: Comply with ASTM C 645 requirements for metal unless otherwise indicated.

1. Protective Coating: Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40 (Z120) unless otherwise indicated.

B. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Fire Trak Corp.; Fire Trak System.
   b. Grace Construction Products; FlameSafe FlowTrak System.

c. Metal-Lite, Inc.; The System.
d. Steel Network Inc. (The); VertiClip SLD or VertiTrack VTD Series.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with manufacturer's written recommendations.

B. Trim Accessories: Cornerbead, edge trim, and control joints of material and shapes that comply with gypsum board shaft wall assembly manufacturer's written recommendations for application indicated.

C. Steel Drill Screws: ASTM C 1002 unless otherwise indicated.

D. Track Fasteners: Power-driven fasteners of size and material required to withstand loading conditions imposed on shaft wall assemblies without exceeding allowable design stress of track, fasteners, or structural substrates in which anchors are embedded.

1. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing according to ASTM E 488 conducted by a qualified testing agency.
2. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing according to ASTM E 1190 conducted by a qualified testing agency.

E. Sound Attenuation Blankets: As specified in Division 09 "Gypsum Board."

F. Acoustical Sealant: As specified in Division 09 "Gypsum Board."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates to which gypsum board shaft wall assemblies attach or abut, with Installer present, including hollow-metal frames, elevator hoistway door frames, cast-in anchors, and structural framing. Examine for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Sprayed Fire-Resistive Materials: Coordinate with gypsum board shaft wall assemblies so both elements of Work remain complete and undamaged. Patch or replace sprayed fire-resistive

materials removed or damaged during installation of shaft wall assemblies to comply with requirements specified in Section 078100 "Applied Fireproofing."

B. After sprayed fire-resistive materials are applied, remove only to extent necessary for installation of gypsum board shaft wall assemblies and without reducing the fire-resistive material thickness below that which is required to obtain fire-resistance rating indicated. Protect remaining fire-resistive materials from damage.

3.3 INSTALLATION

A. General: Install gypsum board shaft wall assemblies to comply with requirements of fire-resistance-rated assemblies indicated, manufacturer's written installation instructions, and ASTM C 754 other than stud-spacing requirements.

B. Do not bridge building expansion joints with shaft wall assemblies; frame both sides of expansion joints with furring and other support.

C. Install supplementary framing in gypsum board shaft wall assemblies around openings and as required for blocking, bracing, and support of gravity and pullout loads of fixtures, equipment, services, heavy trim, furnishings, wall-mounted door stops, and similar items that cannot be supported directly by shaft wall assembly framing.

1. Elevator Hoistway: At elevator hoistway-entrance door frames, provide jamb struts on each side of door frame.
2. Reinforcing: Where handrails directly attach to gypsum board shaft wall assemblies, provide galvanized steel reinforcing strip with 0.033-inch (0.84-mm) minimum thickness of base metal (uncoated), accurately positioned and secured behind at least one layer of face panel.

D. Penetrations: At penetrations in shaft wall, maintain fire-resistance rating of shaft wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items.

E. Isolate perimeter of gypsum panels from building structure to prevent cracking of panels, while maintaining continuity of fire-rated construction.

F. Firestop Tracks: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

G. Control Joints: Install control joints at locations indicated on Drawings, according to ASTM C 840 and in specific locations approved by Architect while maintaining fire-resistance rating of gypsum board shaft wall assemblies.

H. Sound-Rated Shaft Wall Assemblies: Seal gypsum board shaft walls with acoustical sealant at perimeter of each assembly where it abuts other work and at joints and penetrations within each assembly.

I. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.4 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, or mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, and irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.5 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area

END OF SECTION 09 21 16

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

B. Related Requirements:

1. None

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For dimpled steel studs and runners and firestop tracks, from ICC-ES.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), Coating with equivalent corrosion resistance of ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.

B. Studs and Runners: ASTM C 645. Use either steel studs and runners or dimpled steel studs and runners.

1. Steel Studs and Runners:

a. Thickness: 20 ga. **Unless otherwise indicated**
b. Depth: As indicated on Drawings.

C. Slip-Type Head Joints: Where indicated, provide one of the following:

1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches (305 mm) of the top of studs to provide lateral bracing.
2. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch- (51-mm-) deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
3. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

a. Products: Subject to compliance with requirements, provide one of the following or approved equal:

1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
2) MBA Building Supplies; FlatSteel Deflection Track or Slotted Deflecto Track.
3) Steel Network Inc. (The); VertiTrack VTD Series.
4) Superior Metal Trim; Superior Flex Track System (SFT).
5) Telling Industries; Vertical Slip Track.

D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

1. Products: Subject to compliance with requirements, provide one of the following, or approved equal:

a. Fire Trak Corp.; Fire Trak System.
b. Grace Construction Products; FlameSafe FlowTrak System.

E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base-Metal Thickness: 0.0219 inch (0.556 mm).

F. Cold-Rolled Channel Bridging: Steel, 0.053-inch (1.34-mm) minimum base-metal thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches (38 by 38 mm), 0.068-inch- (1.72-mm-) thick, galvanized steel.

G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base-Metal Thickness: 0.0219 inch (0.556 mm).
2. Depth: 7/8 inch (22.2 mm).

H. Resilient Furring Channels: 1/2-inch- (13-mm-) deep, steel sheet members designed to reduce sound transmission.

1. Configuration: Asymmetrical or hat shaped.

I. Cold-Rolled Furring Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges.

1. Depth: As indicated on Drawings.
2. Furring Brackets: Adjustable, corrugated-edge type of steel sheet with minimum uncoated-steel thickness of 0.033 inch (0.8 mm).
3. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

J. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches (32 mm), wall attachment flange of 7/8 inch (22 mm), minimum uncoated-metal thickness of 0.018 inch (0.45 mm), and depth required to fit insulation thickness indicated.

2.3 SUSPENSION SYSTEMS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- (1.59-mm-) diameter wire, or double strand of 0.048-inch- (1.21-mm-) diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.

C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch (4.12 mm) in diameter.

D. Flat Hangers: Steel sheet, 1 by 3/16 inch (25 by 5 mm) by length indicated.

E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch (1.34 mm) and minimum 1/2-inch- (13-mm-) wide flanges.

F. Furring Channels (Furring Members):

1. Cold-Rolled Channels: 0.053-inch (1.34-mm) uncoated-steel thickness, with minimum 1/2-inch- (13-mm-) wide flanges, 3/4 inch (19 mm) deep.
2. Steel Studs and Runners: ASTM C 645.
3. Dimpled Steel Studs and Runners: ASTM C 645.
4. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch (22 mm) deep.
5. Resilient Furring Channels: 1/2-inch- (13-mm-) deep members designed to reduce sound transmission.

G. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Armstrong World Industries, Inc.; Drywall Grid Systems.
b. Chicago Metallic Corporation; Drywall Grid System.
c. USG Corporation; Drywall Suspension System.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials:

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches (610 mm) o.c.
2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
2. Multilayer Application: 16 inches (406 mm) o.c. unless otherwise indicated.
3. Tile Backing Panels: 16 inches (406 mm)] o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

    a. Install two studs at each jamb unless otherwise indicated.
    b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (13-mm) clearance from jamb stud to allow for installation of control joint in finished assembly.
    c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

    a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
6. Curved Partitions:

    a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
    b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of no fewer than two studs at ends of arcs, place studs 6 inches (150 mm) o.c.

E. Direct Furring:

1. Screw to wood framing.
2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.

F. Z-Furring Members:

1. Erect insulation, specified in Section 072100 "Thermal Insulation," vertically and hold in place with Z-furring members spaced 24 inches (610 mm) o.c.
2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches (610 mm) o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches (305 mm) from corner and cut insulation to fit.

G. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch (3 mm) from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Hangers: 48 inches (1219 mm) o.c.
2. Carrying Channels (Main Runners): 48 inches (1219 mm) o.c.
3. Furring Channels (Furring Members): 16 inches (406 mm) o.c.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

   a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

   a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet (3 mm in 3.6 m) measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.6 WASTE MANAGEMENT

A. Coordinate with Section 017423.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 09 22 16

SECTION 09 29 00 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the performance criteria, materials, production, and erection of gypsum board for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all gypsum board as required by this section, schedules, keynotes and drawings including, but not limited to the following.

1. Interior gypsum board.
2. Moisture resistant gypsum board (all wet locations and as tile backer)
3. Trim.

B. Related Requirements:
1. Section 09 22 16 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance of Ceiling Suspension Systems: Ceiling suspension systems and cantilevered ceiling soffits shall withstand the effects of gravity and seismic effects.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings for Gypsum Board Ceiling Systems: Include reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, and as reviewed by a qualified professional engineer using input from installers of the items involved:.

1. Layout of all ceilings/soffits with dimensions based on as-built construction
2. Gypsum board ceiling suspension-system members.
3. Miscellaneous metal/steel framing sizing for soffits and cantilevers
4. Method of attaching hangers to building structure.

   a. Furnish layouts and sizing for cast-in-place anchors, clips, metal framing, miscellaneous steel shapes, and other ceiling attachment devices whose installation is specified in other Sections.

5. Size and location of initial access modules for suspended gypsum board ceilings and soffits.
6. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
7. Minimum Drawing Scale: 1/8 inch = 1 foot (1:96) for layout drawings, 1 inch = 1 foot for detail drawings

C. Evaluation Reports: For each ceiling suspension system and anchor and fastener type, from ICC-ES.

D. Field quality-control reports.

E. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch- (300-mm-) long length for each trim accessory indicated.
2. Textured Finishes: 12” x 12” sample for each textured finish indicated and on same backing indicated for Work.

1.5 QUALITY ASSURANCE

A. Mockups: Before beginning gypsum board installation, install mockups of at least 100 sq. ft. (9 sq. m) in surface area to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Install mockups for the following:

   a. Each level of gypsum board finish indicated for use in exposed locations.
   b. Each texture finish indicated.

2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.
3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

PART 2 - Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. National Gypsum Company
2. American Gypsum.
3. CertainTeed Corp.
4. Georgia-Pacific Gypsum LLC.
5. Lafarge North America Inc.
6. USG Corporation.

B. Gypsum Wallboard: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (12.7 mm).
2. Long Edges: Tapered.

C. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch (15.9 mm).
2. Long Edges: Tapered.

D. Flexible Gypsum Board: ASTM C 1396/C 1396M. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.

1. Thickness: 1/4 inch (6.4 mm).
2. Long Edges: Tapered.

E. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 1/2 inch (12.7 mm).
2. Long Edges: Tapered.

A. Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M. (At all corridor walls)

1. Products Paper Faced, ASTM C 1396: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. National Gypsum Company; Hi-Abuse XP.
2. Products Glass-Mat Faced, ASTM C 1658: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. National Gypsum Company; eXP Interior Extreme AR Gypsum Panel.
3. Core**:** 5/8 inch (15.9 mm), Type X.
4. Long Edges: Tapered.
5. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
6. Surface Abrasion Resistance: Level 3 in accordance with ASTM C 1629.
7. Indentation Resistance: Level 1 in accordance with ASTM C 1629.
8. Soft Body Impact Resistance: Level 2 in accordance with ASTM C 1629.

B. Impact-Resistant Gypsum Board: ASTM C 1629/C 1629M. (At all walls in the Kitchen & Servery area)

1. Products Paper Faced, ASTM C 1396: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. National Gypsum Company; Hi-Impact XP.
2. Products Glass-Mat Faced, ASTM C 1658: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Georgia-Pacific Gypsum LLC; DensArmor Plus Impact-Resistant Interior Panel.
   b. National Gypsum Company; eXP Interior Extreme IR Gypsum Panel.
3. Core**:** 5/8 inch (15.9 mm), Type X.
4. Long Edges: Tapered.
5. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.
6. Surface Abrasion Resistance: Level 3 in accordance with ASTM C 1629.
7. Indentation Resistance: Level 1 in accordance with ASTM C 1629.
8. Soft Body Impact Resistance: Level 3 in accordance with ASTM C 1629.
9. Hard Body Impact Resistance: Level 2 in accordance with ASTM C 1629.

C. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces. (At all bathroom locations)

1. Core: 5/8 inch (15.9 mm), Type X.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

D. Glass-Mat Interior Gypsum Board: ASTM C 1658/C 1658M. With fiberglass mat laminated to both sides. Specifically designed for interior use, where indicated on Drawings. Retain "Products" Subparagraph and list of manufacturers and products below to require specific products or a comparable product from other manufacturers. (At all plumbing walls, with or without tile)

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. Georgia-Pacific Gypsum LLC; DensArmor Plus.
   b. National Gypsum Company; eXP Interior Extreme.

2. Core: 5/8 inch, Type X.
3. Long Edges: Tapered.
4. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes:

   a. Cornerbead.
   b. Bullnose bead.
   c. LC-Bead: J-shaped; exposed long flange receives joint compound.
   d. L-Bead: L-shaped; exposed long flange receives joint compound.
   e. U-Bead: J-shaped; exposed short flange does not receive joint compound.
   f. Expansion (control) joint.
   g. Curved-Edge Cornerbead: With notched or flexible flanges.

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

   a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Laminating adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.

D. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

E. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Products: Subject to compliance with requirements, provide product by one of the following:

a. Accumetric LLC; BOSS 824 Acoustical Sound Sealant.
b. Grabber Construction Products; Acoustical Sealant GSC.
c. Pecora Corporation
d. Specified Technologies, Inc.; Smoke N Sound Acoustical Sealant.
e. USG Corporation; SHEETROCK Acoustical Sealant.

2. Acoustical joint sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Thermal Insulation: As specified in Section 07 21 00 "Thermal Insulation."

G. Vapor Retarder: As specified in Section 07 21 00 "Thermal Insulation."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840 and Gypsum Association GA 214-10.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. (0.7 sq. m) in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- (6.4- to 9.5-mm-) wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- (6.4- to 12.7-mm-) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:

1. Wallboard Type: As indicated on Drawings.
2. Type X: As indicated on Drawings and at all fire rated assemblies.
3. Flexible Type: As indicated on Drawings.
4. Ceiling Type: As indicated on Drawings.
5. Abuse-Resistant Type: At interior of exterior walls and whiteboard walls.
6. Impact-Resistant Type: At lobbies, entries and corridors
7. Moisture- and Mold-Resistant Type: As indicated on Drawings and at all wet areas and as tile backer.
8. Glass-Mat Interior Type: At all plumbing wall with or without tile.

B. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
    b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches (400 mm) minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer

joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

D. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

E. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch- (300-mm-) long straight sections at ends of curves and tangent to them.
2. For double-layer construction, fasten base layer to studs with screws 16 inches (400 mm) o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12 inches (300 mm) o.c.

3.4 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints at locations indicated on Drawings and according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. Bullnose Bead: Use at outside corners.
3. LC-Bead: Use at exposed panel edges.
4. L-Bead: Use where indicated.
5. U-Bead: Use at exposed panel edges and where indicated.
6. Curved-Edge Cornerbead: Use at curved openings.

3.5 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840 and Gypsum Association GA 214-10:

1. Level 1:

a. All joints and interior angles shall have tape set in joint compound. Surface shall be free of excess joint compound. Minor tool marks and ridges are acceptable:

1) At ceiling plenum areas, concealed areas, behind metal lockers, behind built-in millwork, and where indicated.

2. Level 2:

a. All joints and interior angles shall have tape embedded in joint compound and wiped with joint knife leaving a thin coating of joint compound over all joints and interior angles. Fastener heads and accessories shall be covered with a coat of joint compound. Surface shall be free of excess joint compound. Minor tools marks and ridges are acceptable. Joint compound applied over the body of the tape at the time of tape embedment shall be considered a separate coat of joint compound and shall satisfy the conditions of this level:

1) At gypsum panels that are substrate for tile or acoustical tile, and where indicated on Drawings.

3. Level 3:

a. All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with joint knife leaving a thin coating of joint compound over all joints and interior angles. One additional coat of joint compound shall be applied over all joints and interior angles. Fastener heads and accessories shall be covered with two separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges:

1) At panel surfaces receiving medium- or heavy-textured finishes before painting, or heavy wallcoverings where lighting conditions are not critical, and where indicated on Drawings.

4. Level 4:

a. All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with joint knife leaving a thin coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. All joint compound shall be smooth and free of tool marks and ridges. Prepared surfaces shall be coated with drywall primer prior to application of final finishes:

1) At panel surfaces receiving light-textured finishes, wallcoverings, and flat paints, and at panel surfaces that will be exposed to view unless otherwise indicated. This is generally the standard exposed finish, unless noted otherwise. Not recommended where glossy or semi-glass enamel paints are specified.

b. Primer and its application to surfaces are specified in other Section 099123 “Painting.”

5. Level 5:

a. All joints and interior angles shall have tape embedded in joint compound and shall be immediately wiped with joint knife leaving a thin coating of joint compound over all joints and interior angles. Two separate coats of joint compound shall be applied over all flat joints and one separate coat of joint compound shall be applied over interior angles. Fastener heads and accessories shall be covered with three separate coats of joint compound. A thin skim coat of joint compound trowel applied, or a material manufactured especially for this purpose and applied in accordance with manufacturer’s recommendations, applied to entire surface. The surface shall be smooth and free of tool marks and ridges. Prepared surfaces shall be coated with drywall primer prior to application of final finishes:

1) At panel surfaces receiving gloss and semigloss enamels and other surfaces subject to severe lighting, and where indicated on Drawings.

b. Primer and its application to surfaces are specified in other Section 099123 “Painting.”

3.6 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

3.7 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other scrap for recycling.

END OF SECTION 09 29 00

SECTION 09 30 13 - CERAMIC TILE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:
   1. Ceramic tile.
   2. Porcelain tile.
   3. Stone thresholds installed as part of tile installations.

B. Related Sections include the following:
   1. Division 9 Section "Gypsum Board Assemblies" for glass mat, water resistant gypsum backing board installed in gypsum wallboard assemblies.

1.3 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:
   1. Level Surfaces: Minimum 0.6.

B. Load-Bearing Performance: For ceramic tile installed on walkway surfaces, provide installations rated for the following load-bearing performance level based on testing assemblies according to ASTM C 627 that are representative of those indicated for this Project:
   1. Moderate: Passes cycles 1 through 10.

1.4 SUBMITTALS

A. Product Data: For each type of tile, mortar, grout, and other products specified.

B. Shop Drawings: For the following:
   1. Tile patterns and locations.
   2. Widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

C. Tile Samples for Initial Selection: Manufacturer's color charts consisting of actual tiles or sections of tiles showing the full range of colors, textures, and patterns available for each type and composition of tile indicated. Include Samples of accessories involving color selection.

D. Samples for Verification: Of each item listed below, prepared on Samples of size and construction indicated. Where products involve normal color and texture variations, include Sample sets showing the full range of variations expected.
   1. Each type and composition of tile and for each color and texture required, at least 12 inches square, mounted on braced cementitious backer units, and with grouted joints using product complying with specified requirements and approved for completed work in color or colors selected by Architect.
   2. Full-size units of each type of trim and accessory for each color required.
   3. Stone thresholds in 6-inch lengths.

E. Product Certificates: Signed by manufacturers certifying that the products furnished comply with requirements.

F. Qualification Data: For firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names of architects and owners, and other information specified.

G. Setting Material Test Reports: Indicate and interpret test results for compliance of tile-setting and -grouting products with specified requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Engage an experienced installer who has completed tile installations similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.

B. Source Limitations for Tile: Obtain each color, grade, finish, type, composition, and variety of tile from one source with resources to provide products from the same production run for each contiguous area of consistent quality in appearance and physical properties without delaying the Work.

C. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from a single manufacturer and each aggregate from one source or producer.

D. Source Limitations for Other Products: Obtain each of the following products specified in this Section from one source and by a single manufacturer for each product:
   1. Stone thresholds.
   2. Joint sealants.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement of ANSI A137.1 for labeling sealed tile packages.

B. Prevent damage or contamination to materials by water, freezing, foreign matter, and other causes.

C. Handle tile with temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is completed and ambient temperature and humidity conditions are being maintained to comply with referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Tile Products:
      a. Tilebar
      b. American Olean Tile Company.
      c. Crossville Tile
      d. ProSpec LLC.
      e. Dal-Tile Corporation.
      f. Emser Tile
      g. Stone Source
      h. Horizon Tile

B. Tile-Setting and -Grouting Materials:
      a. American Olean Tile Company.
      b. ProSpec LLC.
      c. Bostik.
      d. Dal-Tile Corporation.
      e. Laticrete International, Inc.
      f. Mapei Corporation.

2.2 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.
   1. Provide tile complying with Standard Grade requirements, unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting Materials" and "Grouting Materials" articles.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:

1. See Finish Schedule for exact tile product information.

D. Factory Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, blend tile in the factory and package so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples.

E. Mounting: Where factory-mounted tile is required, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless another mounting method is indicated.
   1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for these kinds of installations and has a record of successful in-service performance.

2.3 WALL TILE

A. Porcelain Wall Tile Basis of Design: Tilebar “Fordham/Colorplay/Hexart,” & Dal-Tile “Volume” tile complying with the following requirements:

   1. Composition: Porcelain.
   2. Module Size: Varies. Refer to Finish Schedule
   3. Thickness: 5/16 inch.
   4. Colors: As noted on finish schedule.
   5. Pattern and Borders: Contrasting color patterns and borders as directed by the Architect

B. Trim Units: Provide tile trim units to match color and characteristics of adjoining flat tile and to comply with the following requirements:
   1. Size: As indicated, coordinated with sizes and coursing of adjoining flat tile where applicable.
   2. Shapes: As follows, selected from manufacturer's standard shapes:
      a. Round Incorner Base for Thin-Set Mortar Installations: Coved.
      b. 2x8 bullnose where specified on Finish Schedule.
      c. Wainscot Cap for Thin-Set Mortar Installations: Stainless steel trim.
      d. External Corners for Thin-Set Mortar Installations: Stainless steel trim.
      e. Internal Corners: Field-butted square corners, except with coved base and cap angle pieces designed to member with stretcher shapes.

2.4 STONE THRESHOLDS

A. General: Provide stone thresholds that are uniform in color and finish, fabricated to sizes and profiles indicated to provide transition between tile surfaces and adjoining finished floor surfaces.
   1. Fabricate thresholds to heights indicated, but not more than 1/2 inch above adjoining finished floor surfaces, with transition edges beveled on a slope of no greater than 1:2.

B. Marble Thresholds: Provide marble thresholds complying with ASTM C 503 requirements for exterior use and with a minimum abrasive-hardness value of 10 per ASTM C 241.
   1. As selected from manufacturer’s standard colors and finishes.

2.5 SETTING MATERIALS

A. Organic Adhesive: ANSI A136.1, Type I as recommended by manufacturer.

B. Tile Setting Adhesive: Elastomeric, waterproof, liquid applied.

2.6 GROUTING MATERIALS

A. Dry-Set Grout: ANSI A118.6, color as selected from the manufacturer's standard range of colors.

2.7 ELASTOMERIC SEALANTS

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements of Division 7 Section "Joint Sealants."

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints, unless otherwise indicated.

C. Walls: One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and temperature extremes.

D. Floors: Multipart, Pourable Urethane Sealant for Use T: ASTM C 920; Type M; Grade P; Class 25; Uses T, M, A, and, as applicable to joint substrates indicated, O.

E. Available Products: Subject to compliance with requirements, products which may be incorporated into the Work include, but are not limited to, the following:
   1. One-Part, Mildew-Resistant Silicone Sealants:
      a. Dow Corning 786; Dow Corning Corporation.
      b. Sanitary 1700; GE Silicones.
      c. Pecora 898 Sanitary Silicone Sealant; Pecora Corp.
      d. Rhodorsil 6B White; Rhone-Poulenc, Inc.
      e. Tremsil 600 White; Tremco, Inc.
   2. Multipart, Pourable Urethane Sealants:
      a. Chem-Calk 550; Bostik.
      b. Vulkem 245; Mameco International, Inc.
      c. NR-200 Urexpan; Pecora Corp.
      d. THC-900; Tremco, Inc.

2.8 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.9 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

2.10 FINISHING AND EDGE PROTECTION FOR WALLS

A. Install stainless steel edge trim at horizontal and vertical corners of tile installations. Profiles for each location to be selected by Architect.

B. Basis of Design: Schluter Systems, Plattsburgh, N.Y.
   1. Bullnose
   2. Straight profile with anchoring leg
   3. Rounded outer corner with anchoring leg

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
   1. Verify that substrates for setting tile are firm; dry; clean; free from oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 series of tile installation standards for installations indicated.
   2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
   3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust latter in consultation with Architect.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove coatings, including curing compounds, and other substances that contain soap, wax, oil, or silicone and are incompatible with tile-setting materials by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.

B. Provide concrete substrates for tile floors installed with dry-set or latex-portland cement mortars that comply with flatness tolerances specified in referenced ANSI A108 series of tile installation standards for installations indicated.
   1. Use trowelable leveling and patching compounds per tile-setting material manufacturer's written instructions to fill cracks, holes, and depressions.
   2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within the ranges selected during Sample submittals, verify that tile has been blended in the factory and packaged so tile units taken from one package show the same range in colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 INSTALLATION, GENERAL

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 series of tile installation standards in "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with required TCA installation methods.

C. Extend tile work into recesses and under or behind equipment and fixtures to form a complete covering without interruptions, unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

D. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

E. Jointing Pattern: Lay tile in grid pattern, unless otherwise indicated. Align joints when adjoining tiles on floor, base, walls, and trim are the same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. Provide uniform joint widths, unless otherwise indicated.
   1. For tile mounted in sheets (if any), make joints between tile sheets the same width as joints within tile sheets so joints between sheets are not apparent in finished work.

F. Lay out tile wainscots to next full tile beyond dimensions indicated.

G. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
   1. Locate joints in tile surfaces directly above joints in concrete substrates.

H. Grout tile to comply with the requirements of the following tile installation standards:
   1. For ceramic tile grouts (sand-portland cement, dry-set, commercial portland cement, and latex-portland cement grouts), comply with ANSI A108.10.

3.4 WALL TILE INSTALLATION

A. Install types of tile designated for wall installations to comply with TCA installation methods and ANSI setting-bed standards.

B. Joint Widths: Install tile on walls with the following joint widths:
   1. Ceramic Mosaic Tile: 1/16 inch.
   2. Wall Tile: 1/16 inch.

3.5 EDGE PROTECTION INSTALLATION FOR WALLS

A. Install as per manufacturer’s instructions as an integral component during wall tile installation.

3.6 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.
   1. Remove latex-portland cement grout residue from tile as soon as possible.
   2. Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation. Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning. Flush surface with clean water before and after cleaning.

B. Finished Tile Work: Leave finished installation clean and free of cracked, chipped, broken, unbonded, and otherwise defective tile work.

C. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure tile is without damage or deterioration at the time of Substantial Completion.
   1. When recommended by tile manufacturer, apply a protective coat of neutral protective cleaner to completed tile walls and floors. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear.
   2. Prohibit foot and wheel traffic from tiled floors for at least 7 days after grouting is completed.

D. Before final inspection, remove any cleaner from tile surfaces.

3.7 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

   1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
   2. Set aside and protect materials suitable for reuse and/or remanufacturing.
   3. Separate and fold up metal banding; flatten and place along with other scrap for recycling.

END OF SECTION 09 30 13

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SECTION 09 51 23 - ACOUSTICAL CEILING TILES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the performance criteria, materials, production, and erection of continuous/wall-to-wall acoustical tile ceilings for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all acoustical tile ceilings as required by the this section, schedules, keynotes and drawings, including, but not limited to the following:

1. Acoustical tiles for ceilings.
2. Exposed grid suspension systems.
3. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.
4. Perimeter trim

1.3 PRE-INSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, 6-inches- (150-mm-) in size.

C. Samples for Initial Selection: For components with factory-applied color finishes.

D. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Tile: Set of full-size Samples of each type, color, pattern, and texture.
2. Concealed Suspension-System Members: 6-inch- (150-mm-) long Sample of each type.
3. Exposed Moldings and Trim: Set of 6-inch- (150-mm-) long Samples of each type and color.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Ceiling suspension-system members.
2. Method of attaching hangers to building structure.

a. Furnish layouts for cast-in-place anchors, clips, and other ceiling attachment devices whose installation is specified in other Sections.

3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Minimum Drawing Scale: 1/8 inch = 1 foot (1:96).

B. Qualification Data: For testing agency.

C. Product Test Reports: For each acoustical tile ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

D. Evaluation Reports: For each acoustical tile ceiling suspension system and anchor and fastener type, from ICC-ES.

E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Units: Full-size tiles equal to **2** percent of quantity installed.
2. Suspension-System Components: Quantity of each concealed grid and exposed component equal to **2** percent of quantity installed.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to the National Voluntary Laboratory Accreditation Program (NVLAP) for testing indicated.

B. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.

C. Acoustical Panels: As with other architectural features located at the ceiling, may obstruct or skew the planned fire sprinkler water distribution pattern through possibly delay or accelerate

the activation of the sprinkler or fire detection systems by channeling heat from a fire either toward or away from the device. Designers and installers are advised to consult a fire protection engineer, NFPA 13, or their local codes for guidance where automatic fire detection and suppression systems are present.

D. Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of typical ceiling area as shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical tiles, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

1.10 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to the following:
1. Acoustical Panels: Sagging and warping
2. Grid System: Rusting and manufacturer's defects
3.

B. Warranty Period:
1. Acoustical panels: Ten (10) years from date of substantial completion.
2. Grid: Ten (10) years from date of substantial completion.
3. Acoustical panels and grid systems with HumiGuard Plus or HumiGuard Max performance supplied by one source manufacturer is Thirty (30) years from date of substantial completion.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not install acoustical tile ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical tile ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Design and size components to withstand seismic loads in accordance with the minimum established by ASTM C636.

B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
2. Smoke-Developed Index: 50 or less.

C. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ACOUSTICAL TILES, GENERAL

A. Source Limitations: Obtain each type of acoustical ceiling tile and supporting suspension system from single source from single manufacturer.

B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent (refer to specific acoustic tile).

C. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.

1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches (400 mm) away from test surface according to ASTM E 795.

D. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type.

1. Where appearance characteristics of acoustical tiles are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

E. Provide glass-fiber based panels made with binder containing no urea formaldehyde.

2.3 ACOUSTICAL TILES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Industries products as indicated on Drawings or comparable product by one of the following:
1. CertainTeed Corp.
2. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. ACT-1: Armstrong Ultima Tegular (As indicated in drawings)
1. Surface Texture: Fine.
2. Composition: Fiberglass.
3. Color: White.
4. Size: 24IN x 24IN
5. Edge Profile: Square Tegular 9/16IN for interface with Suprafine XL 9/16" Exposed Tee grid.
6. Noise Reduction Coefficient(NRC): ASTM C 423; Classified with UL label on product carton 0.95.
7. Ceiling Attenuation Class (CAC)
8. Sabin: N/A
9. Articulation Class (AC): ASTM E 1111; 190.
10. Flame Spread: ASTM E 1264; Class A (UL).
11. Light Reflectance White Panel: ASTM E 1477; 0.90.
12. Dimensional Stability: HumiGuard Plus.
13. Recycle Content: Post-Consumer - 12% Pre-Consumer Waste - 59%.

C. ACT-2: Armstrong Ceramaguard Fine Fissured, Square Lay-In (Kitchen Area and restrooms or indicated in drawings)
1. Surface Finish: Scrubbable factory-applied plastic paint finish
2. Composition: Ceramic and Mineral Fiber composite
3. Color: White
4. Size: 24in X 24in X 5/8 in
   a. Sag Resistance
   b. Anti Mold/ Mildew & Bacteria: Totally inorganic product
   c. Fire Performance: ASTM E8. Flame Spread Index 25 or less, Smoke Developed Index 50 or less

2.4 METAL SUSPENSION SYSTEMS, GENERAL

A. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Metal Suspension-System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.

C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635/C 635M, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.135-inch- (3.5-mm-) diameter wire.

D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.

E. Angle Hangers: Angles with legs not less than 7/8 inch (22 mm) wide; formed with 0.04-inch- (1-mm-) thick, galvanized-steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation; with bolted connections and 5/16-inch- (8-mm-) diameter bolts.

F. Seismic Struts: Manufacturer's standard compression struts designed to accommodate lateral forces.

G. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical tiles in-place.

2.5 METAL SUSPENSION SYSTEM

A. Basis-of-Design Product: Subject to compliance with requirements, Armstrong product or provide comparable product by one of the following:

1. Armstrong World Industries, Inc.
2. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Pair suspension systems with the following ACT and ATC types:
1. ACT-1: 9/16 inch Suprafine XL.
2. ACT-2: 15/16 inch Prelude XL.

C. Direct-Hung, Double-Web Suspension System Components: Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction with exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.
a. Structural Classification: ASTM C 635 Intermediate Duty

b. Color: White and match the actual color of the selected ceiling tile, unless noted otherwise.
c. Acceptable Product: Suprafine XL 9/16" Exposed Tee as manufactured by Armstrong World Industries

D. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

E. Wire for Hangers and Ties: ASTM A 641, Class 1 zinc coating, soft annealed, with a yield stress load of at least time three design load, but not less than 12 gauge.
1. Access: Upward and end pivoted or side pivoted, with initial access openings of size indicated below and located throughout ceiling within each module formed by main and cross runners, with additional access available by progressively removing remaining acoustical tiles.

2.6 METAL EDGE MOLDINGS AND TRIM

A. Manufacturers – Basis of Design: Subject to compliance with requirements, Armstrong product or provide comparable product by one of the following:
1. USG Interiors, Inc.; Subsidiary of USG Corporation.

B. Products – 2” Axiom trim, or equal

C. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations complying with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

1. Provide manufacturer's standard edge moldings that fit acoustical tile edge details and suspension systems indicated and that match width and configuration of exposed runners unless otherwise indicated.
2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

2.7 ACOUSTICAL SEALANT

A. Products: Subject to compliance with requirements, provide one of the following:

1. Acoustical Sealant for Exposed and Concealed Joints:

a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
b. USG Corporation; SHEETROCK Acoustical Sealant.

2. Acoustical Sealant for Concealed Joints:

a. Henkel Corporation; OSI Sealants Pro-Series SC-175 Rubber Base Sound Sealant.
b. Pecora Corporation; AIS-919.
c. Tremco, Inc.; Tremco Acoustical Sealant.

B. Acoustical Sealant: Manufacturer's standard sealant complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

1. Exposed and Concealed Joints: Nonsag, paintable, nonstaining latex sealant.
2. Concealed Joints: Nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant.
3. Acoustical sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.8 MISCELLANEOUS MATERIALS

A. Acoustical Tile Adhesive: Type recommended by acoustical tile manufacturer, bearing UL label for Class 0-25 flame spread.

1. Adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Staples: 5/16-inch- (8-mm-) long, divergent-point staples.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine acoustical tiles before installation. Reject acoustical tiles that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Testing Substrates: Before installing adhesively applied tiles on wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.

B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION OF SUSPENDED ACOUSTICAL TILE CEILINGS

A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
8. Do not attach hangers to steel deck tabs.
9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
10. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches (200 mm) from ends of each member.
11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical tiles.

1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
2. Screw attach moldings to substrate at intervals not more than 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.2 mm in 3.6 m). Miter corners accurately and connect securely.
3. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Arrange directionally patterned acoustical tiles as follows:

1. As indicated on reflected ceiling plans.

G. Install acoustical tiles in coordination with suspension system and exposed moldings and trim. Place splines or suspension-system flanges into kerfed edges so tile-to-tile joints are closed by double lap of material.

1. Fit adjoining tile to form flush, tight joints. Scribe and cut tile for accurate fit at borders and around penetrations through tile.
2. Hold tile field in compression by inserting leaf-type, spring-steel spacers between tile and moldings, spaced 12 inches (305 mm) o.c.
3. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Compliance of seismic design.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.

C. Perform the following tests and inspections of completed installations of acoustical tile ceiling hangers and anchors and fasteners in successive stages and when installation of ceiling suspension systems on each floor has reached 20 percent completion but no tiles have been installed. Do not proceed with installations of acoustical tile ceiling hangers for the next area until test results for previously completed installations of acoustical tile ceiling hangers show compliance with requirements.

1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf (890 N) of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf (1957 N) of tension.
2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.

D. Acoustical tile ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 CLEANING

A. Clean exposed surfaces of acoustical tile ceilings, including trim and edge moldings. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace tiles and other ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.6 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 09 51 23

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SECTION 09 54 46 - FELTWORKS™ Blades (Ebbs & Flows) Acoustical Panels

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.2 SUMMARY

a) Section Includes:

1. Non-Woven layered and formed Polyester felt fiber ceiling panels
2. Wire hangers, fasteners, main runners, cross tees, wall angle moldings and accessories.

b) Related Sections:

1. Section 09 53 00 - Acoustical Ceiling Suspension Assembly
2. Section 09 20 00 - Plaster and Gypsum Board
3. Section 09 22 16 - Non-Structural Metal Framing
4. Section 01 81 13 - Sustainable Design Requirements
5. Section 01 81 19 - Indoor Air Quality Requirements
6. Divisions 23 (15) - HVAC
7. Division 26 (16) Sections - Electrical Work

c) Alternates

1. Prior Approval: Unless otherwise provided for in the Contract documents, submit proposed product substitutions no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review and acceptance. Approved products will be set forth by the Addenda. If a substitution is included in a Bid and is not approved by an Addendum, the specified products shall be provided as in place of the substitute without additional compensation.
2. Submittals, which do not provide adequate data for the product evaluation, will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); panel design, size, composition, color, and finish; suspension system component profiles and sizes; compliance with the referenced standards.

1.3 REFERENCES

a) American Society for Testing and Materials (ASTM):

1. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber

2. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
3. ASTM E580 Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Seismic Restraint.
4. ASTM C423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
5. ASTM E795 Standard Practices for Mounting Test Specimens During Sound Absorption Tests
6. International Building Code
7. ASHRAE Standard 62 1 2004 Ventilation for Acceptable Indoor Air Quality
8. California Department of Public Health CDPH/EHLB Emission Standard Method Version 1.2 2017
9. California Green Building Standards Code Cal Green Title 24
10. NFPA 70 National Electrical Code
11. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures
12. International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components
13. LEED - Leadership in Energy and Environmental Design is a set of rating systems for the design, construction, operation, and maintenance of green buildings
14. Underwriters Laboratories Green Guard
15. International Living Building Challenge

1.4 SUBMITTALS

a) **Shop Drawings**: Provide layout including panel type and components used in the assembly of the ceiling. Show locations of items that are to be coordinated with the ceiling.

b) **Installation Instructions**: Submit manufacturer's installation instructions as referenced in Part three, Installation.

c) **Samples:** Minimum 6 inch x 6 inch sample of the colors selected in the ceiling design, include manufacturer sample of suspension components.

d) **Product Data:** Submit manufacturer's technical data for each type of ceiling unit and suspension system required.

e) **Certifications:** Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.

f) **Non-Conformance:** All products not conforming to the requirements of this specification and or the manufacturer's published values are to be disposed. The Contractor performing the work will replace with approved product at their expense.

1.5 QUALITY ASSURANCE

a) Single-Source Responsibility: Provide ceiling panel units and suspension components by a single manufacturer.

b) Fire Performance Characteristics: Identify ceiling components with appropriate markings of applicable testing and inspecting organization.

   1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with Class A products.

      i. Flame Spread: 25 or less

      ii. Smoke Developed: 450 or less

c) Fire Sprinklers: Ceiling systems may obstruct or Skew the planned water distribution pattern of fire sprinkler. In addition to creating a possible delaying or accelerating the activation of the sprinkler of fire detection system. Consult with a fire protection engineer for guidance.

d) Coordination of Work: Coordinate ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.6 DELIVERY, STORAGE, AND HANDLING

a) Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.

b) Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.

c) White gloves recommended for handling to avoid marring, especially on light color panels.

1.7 PROJECT CONDITIONS

a) Space Enclosure:

   I. HumiGuard Plus Ceilings: Building areas to receive ceilings shall be free of construction dust and debris. Products with HumiGuard Plus performance and hot dipped galvanized steel suspension systems can be installed up to 120°F (49°C) and in spaces before the building is enclosed, where HVAC systems are cycled or not operating. Cannot be used in exterior applications where standing water is present or where moisture will come in direct contact with the ceiling.

1.8 WARRANTY

a) Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period.

b) Warranty Period:

   I. Acoustical panels and Suspension: One (1) year from date of substantial completion

c) The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.9 SUSTAINABLE MATERIALS

a) The GREENGUARD Certification Program gives assurance that products designed for use in indoor spaces meet strict chemical emissions limits, which contribute to the creation of healthier interiors. GREENGUARD Certified products meet stringent chemical emissions requirements, such as being screened for more than 10,000 volatile organic compounds (VOCs).

b) Health Product Declaration. The end use product has a published, complete Health Product Declaration with disclosure at a minimum of 1000ppm of known hazards in compliance with the Health Product Declaration open Standard.

c) Declare Label. The end use product has a published Declare label by the International Living Future Institute with disclosure of 100 ppm with a designation of Red List Free or Compliant (less than 1% proprietary ingredients).

d) Low Emitting products with VOC emissions data. Preference will also be given to manufacturers that can provide emissions data showing their products meet CDHP Standard Method v1.2 (Section 01350).

e) Life cycle analysis. Products that have communicated lifecycle data through Environmental Product Declarations (EPDs) will be preferred.

f) Products meeting LEED V4 requirements.

1.10 MAINTENANCE

a) Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.

   1. Ceiling Units: Furnish quality of full-size units equal to 2.0 percent of amount installed.

   2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 1.0 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

a) Basis of Design FELTWORKS Blades:

   1. Armstrong World Industries, Inc.

b) Suspension Systems:

   1. Armstrong World Industries, Inc.

2.2.0 CEILING UNITS

a) Ceiling Panel:

   1. Surface Texture: Soft

2. Composition: Non-woven layered and formed Polyester felt (PET) fiber
3. Color: Refer to Finish Schedule
4. Edge Profile: Square
5. Light Reflectance (LR) Cotton Panel: ASTM E 1477; 0.80
6. Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label
7. Green Guard Gold Certified
8. Sizes
    i. 6533KEF0001_ _ _ 96" Ebbs & Flows Blades Kit Includes 6 unique shapes – 4 of each – 24 pcs per kit Varies x 96" x 3/8
    ii. 6533KEF0002_ _ _ 48" Ebbs & Flows Blades Kit Includes 12 unique shapes – 2 of each – 24 pcs per kit Varies x 48" x 3/8"
    iii. Customer Blades Rectangular Vertical Hook Custom Blades Available
        1. Length 28”- 96”
        2. Depth 5”- 16”
9. Acoustical Performance is tested per ASTM C423 and mounted in accordance with ASTM E795. NRC of 0.85 based on E-400 mounting*
10. Flame Spread: Class A
11. Dimensional Stability: HumiGuard Plus.
12. Acceptable Product: FELTWORKS Blades Ebbs & Flows as manufactured by Armstrong World Industries.

2.2.1 SUSPENSION SYSTEMS

a) **Armstrong Aluminum Suspension System**:
    1. Acceptable Product: Listed Below as manufactured by Armstrong World Industries, Inc. Items are available in custom colors; contact ASQuote@armstrongceilings.com.
        i. Item 8230 – 96” Suspension Bar for 3/8” FeltWorks Blades connector holes on both ends
        ii. Item 6651AB - 96” Suspension Bar End-to-End Connectors
        iii. Item 6655 – Blades Hanging Kit – Each kit includes 4 hanging assemblies, use on kit for each suspension

PART 3 - EXECUTION

3.1 EXAMINATION

a) Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out.

b) Proper designs for both supply air and return air, maintenance of the HVAC filters and building interior space are essential to minimize soiling. Before starting the

HVAC system, make sure supply air is properly filtered and the building interior is free of construction dust.

3.2 PREPARATION

a) Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders, and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

3.3 INSTALLATION

a) Install suspension system and blades in compliance with the approval of the authorities having jurisdiction, and in accordance with the manufacturer's FELTWORKS Blades Installation Instructions.

3.4 ADJUSTING AND CLEANING

a) Replace damaged and broken panels.

b) Clean exposed surfaces of ceilings panels, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.

END OF SECTION

SECTION 09 65 13 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the performance criteria, materials, production, and erection of resilient base and accessories for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all resilient base and accessories as required by this section, schedules, keynotes and drawings, including, but not limited to the following:

1. Resilient base.
2. Resilient molding accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches (300 mm) long.

C. Samples for Initial Selection: For each type of product indicated.

D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches (300 mm) long.

E. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. No extra material to be purchased for purpose of attic stock. All left over material from construction to constitute attic stock – store, maintain and protect accordingly. Package with protective covering for storage and identified with labels describing contents.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.6 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. FloorScore Compliance: Resilient base shall comply with requirements of FloorScore certification.

2.2 THERMOPLASTIC-RUBBER BASE

A. Basis of Design: Subject to compliance with requirements, provide Tarkett; Baseworks 4 ” **or** comparable products by one of the following:

1. Mannington
2. Armstrong World Industries, Inc.
3. Burke Mercer Flooring Products, Division of Burke Industries Inc.
4. Flexco.
5. Mondo Rubber International, Inc.
6. Nora Systems, Inc.
7. Roppe Corporation, USA.
8. VPI, LLC, Floor Products Division.

B. Product Standard: Tarkett Baseworks Cove Base.

1. Group: I (solid, homogeneous).
2. Style and Location:

1) Profile: 4” Cove

C. Thickness: 5/16"(7.94 mm).

D. Height: 4 "

E. Lengths: Length shall not be less than 1/3 of the length of a wall but not less than 3’-0 whichever is longer.

F. Outside Corners: Pre-Mitered.

G. Inside Corners: Pre-Mitered.

H. Colors: Black See Drawings

2.3 RUBBER MOLDING ACCESSORY

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Tarkett
2. Mannington
3. Roppe Corporation, USA.
4. VPI, LLC, Floor Products Division.

B. Description: Rubber cap for cove carpet; cap for cove resilient flooring; carpet bar for tackless installations; carpet edge for glue-down applications; nosing for carpet; nosing for resilient flooring; reducer strip for resilient flooring; joiner for tile and carpet; transition strips.

C. Profile and Dimensions: As indicated.

D. Locations: Provide rubber molding accessories in areas indicated.

E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less except that adhesive for rubber stair treads shall have a VOC content of 60 g/L or less.

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of flooring, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:

   a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
   b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install resilient products until they are the same temperature as the space where they are to be installed.

1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

   a. Form without producing discoloration (whitening) at bends.

2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.

   a. Miter or cope corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Stair Accessories:

1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
2. Tightly adhere to substrates throughout length of each piece.
3. For treads installed as separate, equal-length units, install to produce a flush joint between units.

C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.

B. Perform the following operations immediately after completing resilient-product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum horizontal surfaces thoroughly.
3. Damp-mop horizontal surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

3.6 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other scrap for recycling.

END OF SECTION 09 65 13

SECTION 09 67 23 - RESINOUS FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Definitions: Resinous flooring includes penetrating, moisture tolerant, two-component epoxy primer, a high performance, three-component mortar consisting of epoxy resin, curing agent and selected, graded aggregates blended with inorganic pigments, a two-component, general service epoxy coating and a selected, graded aggregate.

B. Related Work
   1. Division 3 Self Leveling Toppings
   2. Division 7 Section Joint Sealers

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical data, installation instructions, and general recommendations for each resinous flooring material required. Include certification indicating compliance of materials with requirements.

B. Samples: Submit, for verification purposes, 4-inch square samples of each type of resinous flooring required, applied to a rigid backing, in color and finish indicated.
   1. For initial selection of colors and finishes, submit manufacturer's color charts showing full range of colors and finishes available.

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Obtain primary resinous flooring materials including primers, resins, hardening agents, finish or sealing coats from a single manufacturer with not less than ten years of successful experience in manufacturing and installing principal materials described in this section. Contractor shall have completed at least five projects of similar size and complexity; Stonhard, Palma, or approved equal. Provide secondary materials only of type and from source recommended by manufacturer of primary materials.

B. Pre-Installation Conference
   1. General contractor shall arrange a meeting not less than thirty days prior to starting work.
   2. Attendance
      a. General Contractor
      b. Architect/Owner's Representative
      c. Manufacturer/Installer's Representative

C. ISO 9002: All materials, including primers, resins, curing agents, finish coats, aggregates and sealants are manufactured and tested under an ISO 9002 registered quality system.

1.5 DELIVERY, STORAGE AND HANDLING

A. Material shall be delivered to job site and checked by flooring contractor for completeness and shipping damage prior to job start.

B. All materials used shall be factory pre-weighed and pre-packaged in single, easy to manage batches to eliminate on site mixing errors. No on site weighing or volumetric measurements allowed.

C. Material shall be stored in a dry, enclosed area protected from exposure to moisture. Temperature of storage area shall be maintained between 60 and 85°F/16 and 30°C.

1.6 PROJECT CONDITIONS

A. Concrete substrate shall be properly cured for a minimum of 30 days. A vapor barrier must be present for concrete subfloors on or below grade, or as indicated based on manufacturer's requirements and slab moisture content. Otherwise, an osmotic pressure resistant grout must be installed prior to the resinous flooring.

B. Utilities, including electric, water, heat (air temperature between 60 and 85°F/16 and 30°C) and finished lighting to be supplied by General Contractor.

C. Job area to be free of other trades during, and for a period of 24 hours, after floor installation.

D. Protection of finished floor from damage by subsequent trades shall be the responsibility of the General Contractor.

1.7 WARRANTY

A. Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of one (1) full year from date of installation.

PART 2 - PRODUCTS

2.1 COLORS

A. Colors: Titanium with Nimbus Accent

2.2 EPOXY FLOORING & BASE

A. Basis of Design: Dur-A-Flex Reflexions.

1. Physical Properties: Provide flooring system in which physical properties of topping including aggregate, when tested in accordance with standards or procedures referenced below, are as follows:

Compressive Strength (ASTM C-579)	10,000 psi
Tensile Strength (ASTM C-307)	1,750 psi
Flexural Strength (ASTM C-580)	4,000 psi
Hardness (ASTM D-2240/Shore D Durometer)	85-90
Bond Strength (ASTM D-4541)	>400 psi (100% concrete failure)
Impact Resistance (ASTM D-4226)	> 160 in. lbs.
Abrasion Resistance (ASTM D-4060, Taber Abrader CS-17 wheel)	0.08 gm max. weight loss
Coefficient of Friction (ASTM D-2047/Neoprene-Dry)	0.75
Flexural Modulus of Elasticity (ASTM C-580)	2.0×10^6 psi
Flammability (ASTM D-635)	Self Extinguishing Extent of burning 0.25 inches max.
Thermal Coefficient of Linear Expansion (ASTM C-531)	1.8×10^{-5} in/in°C
Water Absorption (ASTM C-413)	0.2%
Heat Resistance Limitation	140°F/60°C (for continuous exposure) 200°F/93°C (for intermittent spills)
Cure Rate allow (at 77°F/25°C)	8 hours for foot traffic 24 hours for normal operations

2. Stonhard
3. Other manufacturers as approved by Architect.

2.3 JOINT SEALANT MATERIALS

A. Type produced by manufacturer of resinous flooring system for type of service and joint condition indicated.

EXECUTION

3.1 PREPARATION

A. Substrate: Concrete preparation shall be by mechanical means and include use of a scabbler, scarifier or shot blast machine for removal of bond inhibiting materials such as curing compounds or laitance.

3.2 APPLICATION

A. General: Apply each component of resinous flooring system in compliance with manufacturer's directions to produce a uniform monolithic wearing surface of thickness indicated, uninterrupted except at divider strips, sawn joints or other types of joints (if any), indicated or required.

B. Primer: Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates. Coordinate timing of primer application with application of troweled mortar to ensure optimum adhesion between resinous flooring materials and substrate.

C. Troweled Mortar: Mix mortar material according to manufacturer's recommended procedures. Uniformly spread mortar over substrate using manufacturer's specially designed screed box adjusted to manufacturer's recommended height. Hand trowel apply mixed material over freshly primed substrate using stainless steel finishing trowels.

D. Coating/Texture: Remove any surface imperfections by lightly abrading and vacuuming the floor surface. Mix coating and texture according to manufacturer's recommended procedures. Squeegee apply and backroll textured coating with strict adherence to manufacturer's installation procedures and coverage rates.

3.3 FIELD QUALITY CONTROL

A. The right is reserved to invoke the following material testing procedure at any time, and any number of times during period of flooring application.

B. The Owner will engage service of an independent testing laboratory to sample materials being used on the job site. Samples of material will be taken, identified and sealed, and certified in presence of Contractor.

C. Testing laboratory will perform tests for any of characteristics specified, using applicable testing procedures referenced herein, or if none referenced, in manufacturer's product data.

D. If test results show materials being used do not comply with specified requirements, Contractor may be directed by Owner to stop work; remove non-complying materials; pay for testing; reapply flooring materials to properly prepared surfaces which had previously been coated with unacceptable materials.

3.4 CURING, PROTECTION AND CLEANING

A. Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 24 hours.

B. Protect resinous flooring materials from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor is responsible for protection and cleaning of surfaces after final coats.

C. Cleaning: Remove temporary covering and clean resinous flooring just prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring manufacturer.

3.5 WASTE MANAGEMENT

A. Coordinate with Division 01.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 09 67 23

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SECTION 09 68 13 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the performance criteria, materials, production, and erection of carpet tile for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all carpet tile as required by the this section, schedules, keynotes and drawings, including, but not limited to the following:

1. Modular, tufted carpet tile.

B. Related Requirements:

1. Division 03: “Self-Leveling Toppings”

2. Division 09: "Resilient Base and Accessories", "Resilient Tile Flooring" for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:

a. Review delivery, storage, and handling procedures.
b. Review ambient conditions and ventilation procedures.
c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch- (300-mm-) long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. No extra material to be purchased for purpose of attic stock. All left over material from construction to constitute attic stock – store, maintain and protect accordingly. Package with protective covering for storage and identified with labels describing contents.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Master II certification level.

B. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups at locations and in sizes shown on Drawings.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104.

1.10 FIELD CONDITIONS

A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, excess static discharge, loss of tuft bind strength, loss of face fiber, and delamination.
3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. All carpet tile products to be Class A rated.

B. Basis-of-Design Product: Subject to compliance with requirements, provide:

1. INTERFACE, “Whole Earth” and “Open Air”.
2. Color: As per schedule on drawings
3. Pattern: Match Architect's samples.
4. Construction: Tufted
5. Surface Texture: Textured pattern loop
6. Gauge: 1/10 in
7. Dye Method: 100% Solution Dyed
8. Fiber Type: Nylon
9. Size: 9.845 inches by 39.98 inches
10. Installation: Ashlar
11. Performance Characteristics: Foot Traffic Recommendation TARR: Heavy
12. Other manufacturers as approved by Architect.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Metal Edge/Transition Strips: Extruded aluminum with satin finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.

2. Subfloor finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.

G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Perform the following operations for existing carpet tile:
1. Vacuum carpet tile using commercial machine with face-beater element.
2. Remove stains and spots using cleaners as recommended by the carpet tile manufacturer.

C. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

D. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

3.5 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 09 68 13

SECTION 09 77 20 – DECORATIVE FIBERGLASS REINFORCED WALL PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Prefinished polyester glass reinforced plastic sheets and adhered to unfinished cementitious wallboard.

B. Products Not Furnished or Installed under This Section:
1. Gypsum [Cementitious] substrate board.
2. Resilient Base.

1.2 RELATED SECTIONS

A. Division 09 - Finishes

1.3 REFERENCES

A. American Society for Testing and Materials: Standard Specifications (ASTM)
1. ASTM D 256 - Izod Impact Strengths (ft #/in)
2. ASTM D 570 - Water Absorption (%)
3. ASTM D 638 - Tensile Strengths (psi) & Tensile Modulus (psi)
4. ASTM D 790 - Flexural Strengths (psi) & Flexural Modulus (psi)
5. ASTM D 2583- Barcol Hardness
6. ASTM D 5319 - Standard Specification for Glass-Fiber Reinforced Polyester Wall and Ceiling Panels.
7. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

1.4 SUBMITTALS

A. Product Data: Submit sufficient manufacturer's data to indicate compliance with these specifications, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

B. Shop Drawings: Submit elevations of each wall showing location of paneling and trim members with respect to all discontinuities in the wall elevation.

C. Selection Samples: Submit manufacturer’s standard color pattern selection samples representing manufacturer's full range of available colors and patterns.

D. Samples for Verification: Submit appropriate section of panel for each finish selected indicating the color, texture, and pattern required.

1. Submit complete with specified applied finish.
2. For selected patterns show complete pattern repeat.
3. Exposed Molding and Trim: Provide samples of each type, finish, and color.

E. Manufacturers Material Safety Data Sheets (MSDS) for adhesives, sealants and other pertinent materials prior to their delivery to the site (available as downloads for most Marlite's products at http://www.marlite.com/tech-details.aspx or by contacting Marlite at info@marlite.com).

1.5 QUALITY ASSURANCE

A. Conform to building code requirements for interior finish for smoke and flame spread requirements as tested in accordance with:
   1. ASTM E 84 (Method of test for surface burning characteristics of building Materials)
      a. Wall Required Rating – Class [A] [C].

B. Sanitary Standards: System components and finishes to comply with:
   1. United States Department of Agriculture (USDA) requirements for food preparation facilities, incidental contact.
   2. Food and Drug Administration (FDA) 1999 Food Code 6-101.11.
   3. Canadian Food Inspection Agency (CFIA) requirements.

1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver materials factory packaged on strong pallets.

B. Store panels and trim lying flat, under cover and protected from the elements. Allow panels to acclimate to room temperature (70°) for 48 hours prior to installation.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Building are to be fully enclosed prior to installation with sufficient heat (70°) and ventilation consistent with good working conditions for finish work

B. During installation and for not less than 48 hours before, maintain an ambient temperature and relative humidity within limits required by type of adhesive used and recommendation of adhesive manufacturer.
   1. Provide ventilation to disperse fumes during application of adhesive as recommended by the adhesive manufacturer.

1.8 WARRANTY

A. Furnish one year guarantee against defects in material and workmanship.

PART 2 - PRODUCTS

2.1 BASIS OF DESIGN MANUFACTURER

A. Marlite; 202 Harger Street, Dover, OH 44622. 800-377-1221 FAX (330) 343-4668 Email: info@marlite.com www.marlite.com.
   1. Standard FRP

B. Or Equal.

2.2 PANELS

A. Fiberglass reinforced thermosetting polyester resin panel sheets complying with ASTM D 5319.
   1. Coating: Multi-layer print, primer and finish coats or applied over-layer.
   2. Dimensions:
      a. Thickness – 0.090 “ (2.29mm) nominal
      b. Width - 4'-0” (1.22m) nominal
      c. Length – As indicated on the drawings
   3. Tolerance:
      a. Length and Width: +/-1/8 “ (3.175mm)
      b. Square - Not to exceed 1/8 “ for 8 foot (2.4m) panels or 5/32 “ (3.96mm) for 10 foot (2.4m) panels

B. Properties: Resistant to rot, corrosion, staining, denting, peeling, and splintering.
   1. Flexural Strength - 1.0 x 10^4 psi per ASTM D 790. (7.0 kilogram-force/square millimeter)
   2. Flexural Modulus - 3.1 x 10^5 psi per ASTM D 790. (217.9 kilogram-force/square millimeter)
   3. Tensile Strength - 7.0 x 10^3 psi per ASTM D 638. (4.9 kilogram-force/square millimeter)
   4. Tensile Modulus - 1.6 x 10^5 psi per ASTM D 638. (112.5 kilogram-force/square millimeter)
   5. Water Absorption - 0.72% per ASTM D 570.
   6. Barcol Hardness (scratch resistance) of 35 55 as per ASTM D 2583.
   7. Izod Impact Strength of 72 ft. lbs./in ASTM D 256

C. Back Surface: Smooth. Imperfections which do not affect functional properties are not cause for rejection.

D. Front Finish: As Indicated on the Drawings
   a. Color: As chosen by Architect from full range of standard colors
   b. Surface: Standard FRP
   c. Fire Rating – Class A
   d. Size: As indicated on drawings

2.3 BASE

A. Base Molding for 0.090 “ (2.29mm) thick FRP Panels

2.4 MOLDINGS

A. Aluminum Trim: Heavy weight extruded aluminum 6063-T5 alloy prefinished at the factory. (In Corridors)

B. PVC Trim: Thin-wall semi-rigid extruded PVC.(In Kitchens only)

C. SaniSeal Trim: Co-extruded, dual-durometer polypropylene/monprene profiles with Dual-Seal Technology and high-performance pressure sensitive adhesive.

D. Outside Corner Guard

2.5 ACCESSORIES

A. Fasteners: Non-staining nylon drive rivets, as recommended by panel manufacturer.
   1. Match panel colors.
   2. Length to suit project conditions.

B. Adhesive: As recommended by panel manufacturer

C. Sealant:
   1. Clear Silicone Sealant, as recommended by panel manufacturer

PART 3 - EXECUTION

3.1 PREPARATION

A. Examine backup surfaces to determine that corners are plumb and straight, surfaces are smooth, uniform, clean and free from foreign matter, nails countersunk, joints and cracks filled flush and smooth with the adjoining surface.
   1. Verify that stud spacing does not exceed 24” (61cm) on-center.

B. Repair defects prior to installation.
   1. Level wall surfaces to panel manufacturer’s requirements. Remove protrusions and fill indentations.

3.2 INSTALLATION

A. Comply with manufacturer's recommended procedures and installation sequence.

B. Cut sheets to meet supports allowing 1/8” (3 mm) clearance for every 8 foot (2.4m) of panel.
   1. Cut and drill with carbide tipped saw blades or drill bits, or cut with shears.
   2. Pre-drill fastener holes 1/8” (3mm) oversize with high speed drill bit.
      a. Space at 8” (200mm) maximum on center at perimeter, approximately 1” from panel edge.
      b. Space at in field in rows 16’ (40.64cm) on center, with fasteners spaced at 12” (30.48 cm) maximum on center.

C. Apply panels to board substrate, above base, vertically oriented with seams plumb and pattern aligned with adjoining panels.
   1. Install panels with manufacturer's recommended gap for panel field and corner joints.
      a. Adhesive trowel and application method to conform to adhesive manufacturer's recommendations.
      b. Drive fasteners for snug fit. Do not over-tighten.

D. Apply panel moldings to all panel edges using silicone sealant providing for required clearances.
   1. All moldings must provide for a minimum 1/8 " (3mm) of panel expansion at joints and edges, to insure proper installation.
   2. Apply sealant to all moldings, channels and joints between the system and different materials to assure watertight installation.

3.3 CLEANING

A. Remove excess sealant from panels and moldings. Wipe panel down using a damp cloth and mild soap solution or cleaner.

B. Refer to manufacturer's specific cleaning recommendations Do not use abrasive cleaners.

END OF SECTION 09 77 20

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SECTION 09 91 00 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the performance criteria, materials, production, and erection of surface preparation and the application of paint systems for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all surface preparation and the application of paint systems as required by the this section, schedules, keynotes and drawings, including, but not limited to the following substrates:

1. Concrete.
2. Concrete masonry units (CMU).
3. Steel.
4. Cast iron.
5. Galvanized metal.
6. Aluminum (not anodized or otherwise coated).
7. Wood.
8. Gypsum board.
9. Plaster.
10. Spray-textured ceilings.
11. ASJ insulation covering.

B. Related Requirements:

1. Division 05 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.

1.3 DEFINITIONS

A. Gloss Level 1 G! Matte or Flat Finish: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

B. Gloss Level G2 Velvet Finish: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

C. Gloss Level G3 Eggshell Finish: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

D. Gloss Level G4 Satin Finish: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

E. Gloss Level G5 Semi-Gloss Finish: 35 to 70 units at 60 degrees, according to ASTM D 523.

F. Gloss Level G6 Gloss Finish: 70 to 85 units at 60 degrees, according to ASTM D 523.

G. Gloss Level G7 High-Gloss Finish: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. No extra material to be purchased for purpose of attic stock. All left over material from construction to constitute attic stock – store, maintain and protect accordingly. Package with protective covering for storage and identified with labels describing contents.

1.6 QUALITY ASSURANCE

A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

   a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Akzo Nobel
2. Benjamin Moore & Co.
3. ICI Paints.
4. Kelly-Moore Paints.
5. Mastercoating technologies – Zolatone
6. PPG Architectural Finishes, Inc.
7. Sherwin-Williams Company (The)
8. Insl-X

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
7. Pretreatment Wash Primers: 420 g/L.
8. Floor Coatings: 100 g/L.
9. Shellacs, Clear: 730 g/L.
10. Shellacs, Pigmented: 550 g/L.

D. Colors: As indicated in a finish schedule.

2.3 BLOCK FILLERS

A. Block Filler, Latex, Interior/Exterior: MPI #4.

1. Glidden Professional – Concrete Coatings Block Filler Interior / Exterior Primer.
2. Akzo Nobel.
3. Sherwin Williams – Preprite – Interior / Exterior Block filler.

2.4 PRIMERS/SEALERS

A. Primer Sealer, Latex, Interior: MPI #50.

1. Product by one of the approved manufacturers found in the MPI list.

B. Primer, Alkali Resistant, Water Based: MPI #3.

1. Product by one of the approved manufacturers found in the MPI list.

C. Primer Sealer, Interior, Institutional Low Odor/VOC: MPI #149.

1. Product by one of the approved manufacturers found in the MPI list.

D. Primer, Latex, for Interior Wood: MPI #39.

1. Product by one of the approved manufacturers found in the MPI list.

E. Primer Sealer, Alkyd, Interior: MPI #45.

1. Product by one of the approved manufacturers found in the MPI list.

F. Primer Sealer, Alkyd, Interior: MPI #69 (Gymnasium Ceiling).

1. Product by one of the approved manufacturers found in the MPI list.

G. Primer, Bonding, Water Based: MPI #17.

1. Product by one of the approved manufacturers found in the MPI list.

H. Primer, Bonding, Solvent Based: MPI #69.

1. Product by one of the approved manufacturers found in the MPI list.

I. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.5 METAL PRIMERS

A. Primer, Rust-Inhibitive, Water Based: MPI #107.

1. Product by one of the approved manufacturers found in the MPI list.

B. Primer, Alkyd, Anti-Corrosive, for Metal: MPI #79.

1. Product by one of the approved manufacturers found in the MPI list.

C. Primer, Alkyd, Quick Dry, for Metal: MPI #76.

1. Product by one of the approved manufacturers found in the MPI list.

D. Primer, Galvanized, Water Based: MPI #134.

1. Product by one of the approved manufacturers found in the MPI list.

E. Primer, Vinyl Wash: MPI #80.

1. Product by one of the approved manufacturers found in the MPI list.

F. Primer, Quick Dry, for Aluminum: MPI #95.

1. Product by one of the approved manufacturers found in the MPI list.

2.6 WATER-BASED PAINTS

A. Latex, Interior, Institutional Low Odor/VOC, Flat (Gloss Level 1): MPI #143.

1. Product by one of the approved manufacturers found in the MPI list.

B. Latex, Interior, Institutional Low Odor/VOC, (Gloss Level 2): MPI #144.

1. Product by one of the approved manufacturers found in the MPI list.

C. Latex, Interior, Institutional Low Odor/VOC, (Gloss Level 3): MPI #145.

1. Product by one of the approved manufacturers found in the MPI list.

D. Latex, Interior, Institutional Low Odor/VOC, Semi-Gloss (Gloss Level 5): MPI #147.

1. Product by one of the approved manufacturers found in the MPI list.

E. Acrylic, Interior, Institutional Low Odor/VOC, Multicolor MPI # 112.

1. Product by one of the approved manufacturers found in the MPI list.

F. Light Industrial Coating, Exterior, Water Based, Semi-Gloss (Gloss Level 5): MPI #163.

1. Product by one of the approved manufacturers found in the MPI list.

2.7 SOLVENT-BASED PAINTS

A. Alkyd, Interior, (Gloss Level 3): MPI #51.

1. Product by one of the approved manufacturers found in the MPI list.

B. Alkyd, Interior, (Flat) Spray Applied Dry Fall : MPI #118 (Gymnasium Ceiling)

C. Alkyd, Interior, Semi-Gloss (Gloss Level 5): MPI #47.

1. Product by one of the approved manufacturers found in the MPI list.

D. Alkyd, Quick Dry, Semi-Gloss (Gloss Level 5): MPI #81.

1. Product by one of the approved manufacturers found in the MPI list.

2.8 DRY FOG/FALL COATINGS

A. Interior Alkyd Dry Fog/Fall: MPI #118.

1. Basis-of-Design Product: Coronado Paint; Superkote 5000Alkyd Dryfall 105-1/131-1 or equal.

2. VOC Content: E Range of E2.

2.9 FLOOR COATINGS

A. Sealer, Water Based, for Concrete Floors: MPI #99.

1. Product by one of the approved manufacturers found in the MPI list.

2.10 SOURCE QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Concrete: 12 percent.
2. Masonry (Clay and CMU): 12 percent.
3. Wood: 15 percent.
4. Gypsum Board: 12 percent.
5. Plaster: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Plaster Substrates: Verify that plaster is fully cured.

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."
3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."

F. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

G. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

H. Aluminum Substrates: Remove loose surface oxidation.

I. Wood Substrates:

1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
2. Sand surfaces that will be exposed to view, and dust off.
3. Prime edges, ends, faces, undersides, and backsides of wood.
4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

J. Cotton or Canvas Insulation Covering Substrates: Remove dust, dirt, and other foreign material that might impair bond of paints to substrates.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:

1. Paint the following work where exposed in equipment rooms:

   a. Equipment, including panelboards and switch gear.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
   f. Plastic conduit.
   g. Tanks that do not have factory-applied final finishes.
   h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

2. Paint the following work where exposed in occupied spaces:

   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
   f. Plastic conduit.
   g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   h. Other items as directed by Architect.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

4. Do not paint in mechanical rooms except as noted in 3.3.E.1.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.

1. Contractor shall touch up and restore painted surfaces damaged by testing.
2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 PAINTING SCHEDULE

A. Concrete Substrates, Nontraffic Surfaces:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

B. Concrete Substrates, Traffic Surfaces:

1. Water-Based Clear Sealer System:

a. First coat: Sealer, solvent based, for concrete floors, MPI #99.
b. Topcoat: Sealer, solvent based, for concrete floors, MPI #104.

C. CMU Substrates:

1. Institutional Low-Odor/VOC Latex System:

   a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
   b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
   c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

D. Steel Substrates:

1. Quick-Drying Enamel System:

   a. Prime Coat: Primer, alkyd, quick dry, for metal, MPI #76.
   b. Intermediate Coat: Alkyd, quick dry, matching topcoat.
   c. Topcoat: Alkyd, quick dry, semi-gloss (Gloss Level 5), MPI #81.

E. Galvanized-Metal Substrates:

1. Institutional Low-Odor/VOC Latex System:

   a. Prime Coat: Primer, galvanized, water based, MPI #134.
   b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
   c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

F. Aluminum (Not Anodized or Otherwise Coated) Substrates:

1. Institutional Low-Odor/VOC Latex System:

   a. Prime Coat: Primer, quick dry, for aluminum, MPI #95.
   b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
   c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

G. Wood Substrates: Including wood trim, architectural woodwork, doors, wood-based panel products.

1. Institutional Low-Odor/VOC Latex System:

   a. Prime Coat: Primer, latex, for interior wood, MPI #39.
   b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
   c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

H. Fiberglass and Plastic Substrates:

1. Institutional Low-Odor/VOC Latex System:

   a. Prime Coat: Primer, bonding, water based, MPI #17.
   b. Prime Coat: Primer, bonding, solvent based, MPI #69.
   c. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
   d. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

I. Gypsum Board and Plaster Substrates:

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, MPI #149.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

2. Institutional Low-Odor/VOC Acrylic System:

a. Prime Coat: SP203Stain Acrylic Drywall Primer, Master Coating Technologies.
b. Intermediate Coat: Acrylic Interior, Institutional Low Odor/VOC, Multi-color, Master Coating Technologies., #MPI #112.
c. Finish Coat: Acrylic Interior, Institutional Low Odor/VOC, Multi-color, Master Coating Technologies., #MPI #112.

J. Cotton or Canvas and ASJ Insulation-Covering Substrates: Including pipe and duct coverings.

1. Institutional Low-Odor/VOC Latex System:

a. Prime Coat: Primer sealer, latex, interior, MPI #50.
b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), MPI #144.

3.7 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.

2. Set aside and protect materials suitable for reuse and/or remanufacturing.

3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 09 91 00

SECTION 09 93 10 –CONCRETE SEALANT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section specifies an applied sealer for cast-in-place concrete surfaces.

B. Related Sections: Refer to the following specification sections for coordination.

1. Section 033000 - Cast-In-Place Concrete.

1.2 SUBMITTALS

A. Product Data: Submit manufacturer's product data and installation instructions.

1. B Mock-Up: Prepare a test area minimum 2 by 2 feet in size to verify suitability of the sealer and final appearance.

1.3 QUALITY ASSURANCE

A. Manufacturer: Minimum 10 years experience producing concrete coatings.

B. Installer: Licensed installers experienced and trained in the use of specified products.

C. Suitability of Substrate: Concrete surface must be clean and dry with all stains, oil, grease, dust and dirt removed prior to application. A thorough pressure washing is highly recommended.

D. Regulatory Requirements: Comply with requirements of authorities having jurisdiction and applicable codes at the location of the project.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver materials and products in unopened factory labeled packages. Protect from damage.

B. Store in a safe place, out of direct sunlight. Keep containers tightly sealed. Do not allow product to freeze. Use within manufacturer's recommended shelf life, approximately 12 months.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Concrete Sealer: High-performance, non-yellowing, clear acrylic-based sealer by Concrete Coatings Inc., 1105 North 1600 West, Layton, UT 84041, 800-443-2871, www.concretecoatingsinc.com. Provide the following:

1. Primer: DURAPRIME WB, a two component water based epoxy primer formulated with 32% solids for reliable adhesion on damp and porous surfaces. Low oder, fast drying.

2. Sealer: EUCOTHANE, a two component, solvent based, polyester/ aliphatic polyurethan coating that offers outstanding abrasion resistance, flexibility, color stability and weather resistant characteristics.

3. Performance: Concrete sealers shall meet or exceed the following:

   a. Coverage: As recommended by manufacturer.

   b. Moisture Retention, Test ASTM C 309: 0.21 kg/m² at 200 ft² per gallon and 0.32 kg/m² at 300 ft² per gallon.

   c. Gasoline Resistance: Slight dulling after15-minute exposure (ponding).

   d. Tg: 50°C.

   e. Tukon Hardness: 30 minutes at 180°F, 9.3; 30 minutes at 300°F, 13.7.

   f. Pencil Hardness: 30 minutes at 180°F, F; 30 minutes at 300°F, H.

   g. Spray Conditions, Viscosity: 19 seconds, No. 2 Zhan cup.

   h. Abrasion Resistance: 160 mg lost, CS-17 wheel, 1000 g load, 1000 cycles

PART 3 - EXECUTION

3.1 PREPARATION

A. Inspection: Prior to start of application, inspect existing conditions to ensure surfaces are suitable for installation including the following:

1. Concrete has cured for a minimum of 28 days prior to application of sealer.
2. Surface is completely free of sealers, oils, dirt, paint, alkali, penetrating sealers and foreign materials that would prevent the sealer from penetrating the concrete surface.
3. Concrete has been swept clean.
4. Test area has been approved.

3.2 APPLICATION

A. Concrete Sealer: Strictly comply with manufacturer's installation recommendations including the following.

1. Apply after stain has dried at rate recommended by manufacturer.
2. Clean surface as recommended by manufacturer.
3. All concrete flatwork designated as being sealed in the plans and specifications shall be sealed with 2-3 even coats of sealer, at the rate of approximately 150 to 200 square feet per gallon.

3.3 CLEANING AND PROTECTION

A. Protection: Do not cover, but protect floor area from paint and other contaminates that could inhibit the sealer.

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SECTION 10 11 00 - VISUAL DISPLAY SURFACES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work performed under this Section includes the performance criteria, materials, production, and erection of visual display units for the project and consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all visual display units as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction including, but not limited to the following:

1. LED Ticker Display.
2. Visual display wall panels.

1.3 DEFINITIONS

A. LED Ticker Display: Dynamic information hubs, offering real-time updates, data, news, and customized messages to disseminate vital information to building occupants.

B. Visual Display Board Assembly: Visual display surface that is factory fabricated into composite panel form, either with or without a perimeter frame; includes visual display wall panels and tackboards.

C. Visual Display Surface: Surfaces that are used to convey information visually, including surfaces of magnetic markerboards, tackboards, and surfacing materials that are not fabricated into composite panel form but are applied directly to walls.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for visual display surfaces.

B. Shop Drawings: For visual display surfaces. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of panel joints.
2. Show locations of special-purpose graphics for visual display surfaces.
3. Include sections of typical trim members.

C. Samples for Initial Selection: For each type of visual display surface indicated, for units with factory-applied color finishes, and as follows:

1. Actual sections of porcelain-enamel face sheet, tackboard assembly, visual display wall covering.
2. Include accessory Samples to verify color selected.

D. Samples for Verification: For each type of visual display surface indicated.

1. One visual display board assembly, mock-up complete with porcelain – enamel face sheet, tackboard and trim mounted on substrate. Board may be incorporated into project upon acceptance of mock-up.

E. Product Schedule: For visual display surfaces. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of fabrics.

C. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For visual display surfaces to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of visual display board.

B. Source Limitations: Obtain visual display surfaces from single source from single manufacturer.

C. Surface-Burning Characteristics: Class B as determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 75 or less.
2. Smoke-Developed Index: 450 or less.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate appearance and aesthetic effects and set quality standards for installation.

1. Build mockup of typical visual display boards as shown on Drawings. Include accessories.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver factory-built visual display surfaces, including factory-applied trim where indicated, completely assembled in one piece without joints, where possible. If dimensions exceed maximum manufactured panel size, provide two or more pieces of equal length as acceptable to Architect. When overall dimensions require delivery in separate units, prefit components at the factory, disassemble for delivery, and make final joints at the site.

B. Store visual display surfaces vertically with packing materials between each unit.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install visual display surfaces until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Field Measurements: Verify actual dimensions of construction contiguous with visual display surfaces by field measurements before fabrication.

1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.

1.10 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer's standard form in which manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Surfaces lose original writing and erasing qualities.
b. Surfaces exhibit crazing, cracking, or flaking.

2. Warranty Period: 50 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Porcelain-Enamel Face Sheet: Manufacturer's standard steel sheet with porcelain-enamel coating fused to steel; uncoated thickness indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following]:

a. Claridge Products and Equipment, Inc.
b. PolyVision Corporation; a Steelcase company.

c. A-1 visual system.

2. Gloss Finish: Gloss as indicated; dry-erase markers wipe clean with dry cloth or standard eraser.

B. Natural Cork Sheet: Seamless, single-layer, compressed fine-grain cork sheet; bulletin board quality; face sanded for natural finish with surface-burning characteristics indicated.

C. Hardboard: ANSI A135.4, tempered.

D. Fiberboard: ASTM C 208.

E. Extruded Aluminum: ASTM B 221 (ASTM B 221M), Alloy 6063.

2.2 TACKBOARD ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A-1 Visual Systems.
2. Claridge Products and Equipment, Inc.
3. PolyVision Corporation; a Steelcase company.

B. Natural-Cork Tackboard: 1/4-inch- (6-mm-) thick, natural cork sheet factory laminated to 1/4-inch- (6-mm-) thick hardboard backing.

2.3 VISUAL DISPLAY WALL PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A-1 Visual Systems.
2. Claridge Products and Equipment, Inc.
3. PolyVision Corporation; a Steelcase company.
4. Tri-Best Visual Display Products.

B. Marker Wall Sheets: Fabricated from 0.021-inch (0.53-mm) uncoated thickness, porcelain-enamel face sheets fused to steel; for direct application to wall surface.

C. Marker Wall Panels: Fabricated from markerboard assembly indicated.

D. Joint Accessories: Manufacturer's standard, exposed trim at butt joints.

E. Adhesive: Mildew-resistant, nonstaining adhesive, for use with specific tack wall panels and substrate application, as recommended in writing by visual display surface manufacturer.

1. Adhesive shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

F. Primer/Sealer: Mildew-resistant primer/sealer complying with requirements in Division 09 "Painting" and recommended in writing by visual display surface manufacturer for intended substrate.

G. Face Trim: 5/8 clear anodized aluminum with mitered corners.

H. Mounting Clip: Manufacturers standard.

2.4 FABRICATION

A. Porcelain-Enamel Visual Display Assemblies: Laminate porcelain-enamel face sheet and backing sheet to core material under heat and pressure with manufacturer's standard flexible, waterproof adhesive.

B. Visual Display Boards: Factory assemble visual display boards unless otherwise indicated.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display boards at manufacturer's factory before shipment.

C. Factory-Assembled Visual Display Units: Coordinate factory-assembled units with trim and accessories indicated. Join parts with a neat, precision fit.
1. Provide manufacturer's standard mullion trim at joints between markerboards and tackboards of combination units.

D. Modular Visual Display Boards: Fabricated with integral panel clips attached to core material.

E. Aluminum Frames and Trim: Fabricate units straight and of single lengths, keeping joints to a minimum. Miter corners to a neat, hairline closure.

1. Where factory-applied trim is indicated, trim shall be assembled and attached to visual display units at manufacturer's factory before shipment.

2.5 LED TICKER DISPLAY ASSEMBLIES

A. Basis-of-Design Product: Subject to compliance with requirements, provide Sunrise Systems **Model TKR-F2.5-4847** or comparable product by one of the following:

1. Sunrise SESA Technologies (Sunrise Systems).

2. Rise Display.

3. SNA Displays (BOLD™ Interior Series).

B. General Description: Continuous, full-color LED digital display designed for scrolling text, graphics, and live data feeds.

1. Cabinet Construction: Flexible or Rigid Extruded Aluminum chassis designed for [Straight] [Curved] installation.

2. Dimensions:

a. Cabinet Height: 4.7 inches (119 mm).
b. Cabinet Depth: Approximately 2 inches (50 mm).
c. Length: [Insert Total Length] (Sold in increments of approx. 1 foot).

3. Weight: Approximately 3.0 lbs per linear foot.

C. Visual Performance Requirements:

1. Pixel Pitch: 2.5mm.

2. Resolution Height: 48 pixels.

3. LED Type: SMD (Surface Mount Device) RGB 3-in-1.

4. Brightness: Minimum 1200 nits (adjustable for indoor environments).

5. Viewing Angle: 140 degrees horizontal / 140 degrees vertical.

6. Color Capability: 24-bit (16.7 million colors).

D. Software and Connectivity:

1. Control System: Embedded controller capable of processing live data streams (Ethernet/Wi-Fi) without a dedicated external PC at the display location.

2. Content Management: Manufacturers' standard software (e.g., Sunrise "XPS" or "iCandy") to manage:

a. Live financial / stock market data.
b. RSS news feeds.
c. Custom messaging and bitmap graphics.

E. Electrical:

1. Input Voltage: 120V AC, 60Hz.

2. Power Density: Maximum 29 watts per linear foot.

3. Power Entry: Hardwired junction box or plug-in connection at [Right] [Left] end of display.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

B. Color Anodic Finish: AAMA 611, AA-M12C22A32/A34, Class II, 0.010 mm or thicker.

C. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils (0.04 mm). Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

2.8 VISUAL DISPLAY SURFACE SCHEDULE

A. Visual Display Board, Markerboard or Tackboard: Factory assembled.

1. Visual Display: Porcelain-enamel markerboard assembly

   a. Color: White.
   b. Corners: Square.
   c. Width: See schedule below
   d. Height: See schedule below.
   e. Mounting: Wall.
   f. Mounting Height: As indicated on Drawings.
   g. Factory-Applied Aluminum Trim and Marker Rail: Manufacturer's standard with clear anodic finish.

2. Tackboard: Factory assembled – At Teacher Stations in Classrooms

   a. Tack Surface: Natural-cork tackboard assembly.
   b. Color: Tan.
   c. Corners: Square.
   d. Width: See schedule below
   e. Height: See schedule below
   f. Mounting: Wall.
   g. Mounting Height: As indicated on Drawings.
   h. Edges: Concealed by trim.
   i. Factory-Applied Aluminum Trim & Marker Rail: Manufacturer's standard style, with clear anodic finish.

B. VISUAL DISPLAY BOARD SCHEDULE BY ROOM NAME

Program Space	***Total # Spaces***	***LF Visual Display Board (All Display Boards 4'H)***	***LF Tackboard (All Tackboards 4'H)***
	(verify)		
Cafeteria	1	2 @ 8 LF = 16 LF	-
Library	1	-	-
Library Classroom	1	1 @ 8 LF/2 @ 4 LF = 24 LF	2 @ 4 LF = 8 LF
Media Center	2	1 @ 8 LF/2 @ 4 LF = 24 LF	2 @ 4 LF = 8 LF
Computer Classroom	8	1 @ 8 LF/2 @ 4 LF = 24 LF	2 @ 4 LF = 8 LF
Typical Classroom	45	2 @ 8 LF = 16 LF	2 @ 4 LF = 8 LF
Spec. Education Classroom	7	1 @ 8 LF = 8 LF	2 @ 4 LF = 8 LF
Technology Room(s) Each	3	2 @ 8 LF = 16 LF	4 @ 4 LF = 16 LF
Science Laboratories	14	2 @ 8 LF = 16 LF	2 @ 4 LF = 8 LF
Science Prep Room	7	-	-
Main Administration	1	-	-
Vice Principal Office	1	-	-
VP Waiting	1	-	-
Conference Room	1	1 @ 8 LF = 8 LF	-
Teacher Attendance	1	-	-
Attendance	1	1 @ 8 LF = 8 LF	-
Dean of Students	1	-	-
Director of Security	1	-	-
House Administrations	4	-	-
Asst Principal Reception	4	-	-
Guidance Reception	4	-	-
Workroom	4	1 @ 8 LF = 8 LF	-
Teacher Centers	4	-	-
Teacher Center	4	1 @ 8 LF/1 @ 4 LF = 12 LF	-
Workroom	4	1 @ 8 LF = 8 LF	-
Tiger Center	1	-	-
Tiger Center Classrooms	2	2 @ 8 LF = 16 LF	2 @ 4 LF = 8 LF
Exam Room	4	1 @ 4 LF	-
Office	1	-	-
Spec. Education Clerical	1	-	-
Conference	1	1 @ 8 LF = 8 LF	-
Spec. Education Resource	2	-	-
Teacher Secretary Office	2	1 @ 8 LF = 8 LF	-
Scheduling Office	1	2 @ 8 LF = 16 LF	2 @ 4 LF = 8 LF

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Comply with manufacturer's written instructions for surface preparation.

B. Clean substrates of substances that could impair the performance of and affect the smooth, finished surfaces of visual display boards, including dirt, mold, and mildew.

3.3 INSTALLATION, GENERAL

A. General: Install visual display surfaces in locations and at mounting heights indicated on Drawings. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

3.4 INSTALLATION OF LED TICKER DISPLAYS

A. Mounting: Install ticker display using manufacturer’s standard concealed “Cleat & Rail” system.

1. Ensure substrate blocking is sufficient to support 3 lbs/ft load.

B. Alignment: Align modules to ensure a continuous 2.5mm pixel pitch across module joints with no visible seams.

1. Provide one (1) 120V circuit. (Note: one 15A circuit can support approx. 50 linear feet of this model based on 29W/ft max load).

2. Provide one (1) RJ45 Data jack at the primary power entry location.

3.5 INSTALLATION OF FACTORY-FABRICATED VISUAL DISPLAY BOARDS AND ASSEMBLIES

A. Visual Display Boards: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display boards with fasteners at not more than 8 inches (200 mm) o.c. Secure both top and bottom of boards to walls.

3.6 CLEANING AND PROTECTION

A. Clean visual display surfaces according to manufacturer's written instructions. Attach one cleaning label to visual display surface in each room.

B. Touch up factory-applied finishes to restore damaged or soiled areas.

C. Cover and protect visual display surfaces after installation and cleaning.

3.7 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 10 11 00

SECTION 10 14 00 - SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes identifying devices.

B. All Signage to conform with Campus Standards Appendix 4 for final sizing, fonts, colors and overall design

1.2 SUBMITTALS

A. See Division 1 – General Requirements for submittal procedures.

B. Product Data: Manufacturer's printed literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts and colors.
1. When room numbers to appear on signs differ from those on the drawings, include drawing room number on schedule.
2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
3. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit three samples of each type of sign, of size similar to that required for project, illustrating sign style, font and method of attachment.
1. Selection Samples: Where colors are not specified, submit three sets of color selection charts or chips.
2. Verification Samples: Submit samples showing colors selected

E Manufacturer's Installation Instructions: Submit installation template and attachment devices.

1.3 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor and building.

C. Store adhesive attachment tape at ambient room temperatures.

1.5 ENVIRONMENTAL REQUIREMENTS

A. Do not install signs when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

PART 2 PRODUCTS

2.1 CAST ALUMINUM LETTERS

A. Provide cast aluminum letters with text and locations as indicated on Drawings.
   1. Material: 214 or 514 aluminum alloy.
   2. Finish: Sand-blasted edges. Paint as per finish schedule.
   4. Letter Style: Century Gothic Upper Case, Bold
   5. Mounting: Concealed Studs, with stainless steel spacers.

B. Manufacturers
   1. The Southwell Co., San Antonio, TX 78291
   2. Andco Industries Corp., Greensboro, NC 27410
   3. Matthews International Corp., Pittsburgh, PA 15212
   4. Signs and Decal Corp., Brooklyn, NY 11211

2.2 INTERIOR SIGNS

A. Manufacturers:
   1. Timely Signs (Basis of Design)
   2. Ark Ramos
   3. Mohawk Sign Systems, Inc.
   4. Seton Identification Products.
   5. Substitutions: See Division 1 - General Requirements for submittal procedures.

2.3 SIGNAGE APPLICATIONS

A. Accessibility Compliance: All signs are required to comply with ADAAG and ANSI/CC A117.1 and applicable building codes,

B. Room Signs: Provide a sign for every doorway, whether it has a door or not, excluding corridors, lobbies and similar open areas.

2.4 GRAPHIC PROCESS

A. Tactile characters shall be raised the required 1/32" inches from sign face. Glue-on letters or etched backgrounds are not acceptable.

B. All text shall be accompanied by Grade 2 braille. Braille shall be separated ½" from the corresponding raised characters or symbols. Grade 2 braille translation to be provided by signage manufacturer.

C. All letters, numbers and/or symbols shall contrast with their background, either light characters on a dark background or dark characters on a light background. Characters and background shall have a non-glare finish.

D. Plaque material shall be Special Purpose SP125 decorative thermosetting high pressure laminate. Material to be 1/8" thick laminate with a melamine resin surface and a phenolic resin core which provides resistance to abrasion, stains, alcohol, solvents, boiling water, and heat. The material shall be NEMA rated and have flammability and smoke values that meet the standards for flammability of interior materials.

E. Background color as selected by architect according to appendix 4 of the Campus standards.

2.5 ACCESSIBILITY GUIDELINES FOR SIGNAGE

A. Room Identification Signs: Signs which designate permanent rooms or spaces shall comply with the following guidelines:
1. Raised Copy - Letters and numerals shall be raised 1/32" upper case, sans serif or simple serif typestyle.
2. Character Height - Raised characters shall be at least 5/8" high, but no higher than 2".
3. Symbols - Symbols shall be accompanied by the equivalent verbal description placed directly below the symbol. The border dimension of the symbol shall be 6" minimum in height.
4. Braille Tags - Grade 2 Braille shall be on all signs, as required.
5. Colors - The characters and backgrounds of all signs shall be of matte or other non-glare finish. Characters and symbols shall contrast with light characters on a dark background or dark characters on a light background. Colors to be as selected by the Architect from the manufacturer's standard colors.
6. Mounting - Signs shall be installed on the wall adjacent to the latch side of the door. If there is no space on the latch side of the door, including double leaf doors, signs shall be placed on the nearest adjacent wall. Mounting height shall be so that the baseline of the tactile copy is located between 48" at the lowest point to 60" at the highest point. . Mounting location for such signage shall be so that a person may approach within three inches of signage without encountering protruding objects or standing within the swing of a door.

B. Directional and Information Signs: Signs which provide direction to, or information about functional spaces of the building shall comply with the same guidelines as those set for Room Identification Signs with the following additions and exceptions.
1. Character Proportion - Letters and numerals on sign shall have a width to height ratio between 3:5 and 1:1 and a stroke width to height ratio between 1:5 and 1:10.
2. Character Height - Characters and numbers on signs shall be sized according to the viewing distance from which they are to be read. The minimum height is measured using an upper case X. Lower case characters are permitted. Any signs that are suspended

or projected overhead shall have characters at least three inches high and shall maintain a minimum clearance of 80 inches from finished floor.

3. Raised Copy - Directional and Informational signs are NOT required to use raised copy or braille tags.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting Work.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edges level.

C. Sign Locations:
1. Room and Door Signs: Locate on wall at latch side of door. The sign shall be mounted so that the baseline of the tactile copy shall be between 48" at the lowest point to 60" at the highest point above finished floor.
2. If no location is indicated, obtain Owner/s instructions.
3. Maximum Occupancy Signs posted in Assembly spaces in a conspicuous place near the main or exit access doorway.

D. Protect from damage until Substantial Completion; repair or replace damaged items.

3.3 WASTE MANAGEMENT

A. Coordinate with Division 01

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.

2. Set aside and protect materials suitable for reuse and/or remanufacturing.

3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 10 14 00

SECTION 10 44 13 - FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. The work performed under this Section includes the performance criteria, materials, production, and erection of Fire Extinguisher Cabinets for the project and consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all Fire Extinguisher Cabinets as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction.

B. Related Sections:

1. Division 10: "Fire Extinguishers."

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

Samples: For each exposed product and for each color and texture specified.

D. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data: For fire protection cabinets to include in maintenance manuals.

1.5 QUALITY ASSURANCE

Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

Coordinate sizes and locations of fire protection cabinets with wall depths.

D. Pre-installation Conference: Conduct conference at Project site.

Review methods and procedures related to fire protection cabinets including, but not limited to, the following:

a. Schedules and coordination requirements.

1.6 COORDINATION

Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

Coordinate size of fire protection cabinets to ensure that type and capacity of fire hoses, hose valves, and hose racks indicated are accommodated.

Coordinate sizes and locations of fire protection cabinets with wall depths.

1.7 SEQUENCING

Apply decals or vinyl lettering on field painted, fire protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:

1. Sheet: ASTM B 209 (ASTM B 209M).

2. Extruded Shapes: ASTM B 221 (ASTM B 221M).

C. Stainless-Steel Sheet: ASTM A 666, Type 304.

D. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

2.2 FIRE PROTECTION CABINET

Cabinet Type: Suitable for fire extinguisher, FEC and hose, rack, valve, and extinguisher, FAC.

Products: Subject to compliance with requirements, provide one of the following:

a. Fire End & Croker Corporation.
b. J. L. Industries, Inc., a division of Activar Construction Products Group.

c. Kidde Residential and Commercial Division, Subsidiary of Kidde plc.
d. Larsen's Manufacturing Company.
e. Modern Metal Products, Division of Technico Inc.
f. Moon-American.
g. Potter Roemer LLC.
h. Watrous Division, American Specialties, Inc.

Cabinet Construction: Where cabinets are located if fire rated walls, provide “Fire-FX” option for cabinet construction.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- (1.1-mm-) thick, cold-rolled steel sheet lined with minimum 5/8-inch- (16-mm-) thick, fire-barrier material. Provide factory-drilled mounting holes.

Cabinet Material: Steel sheet.

Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated. **(NOT USED)**

1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

E. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

1. Rolled-Edge Trim: 2-1/2-inch (64-mm) and 4-inch (102-mm).backbend depth. Coordinate with wall thicknesses.

F. Surface Mounted Cabinet: Cabinet box surface mounted on walls. **(NOT USED)**

1. Exposed Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

Cabinet Trim Material: Same material and finish as door.

H. Door Material: Steel sheet.

I. Door Style: Fully glazed vertical panel with frame.

J. Door Glazing: Tempered break glass.

Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

L. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.

Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.

4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
   a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
      1) Location: Applied to cabinet glazing.
      2) Application Process: Silk-screened.
      3) Lettering Color: White.
      4) Orientation: Vertical and Horizontal per location.

M. Finishes:

1. Manufacturer's standard baked-enamel paint or powder coat for the following:
   a. Exterior of cabinet door, and trim, except for those surfaces indicated to receive another finish.
   b. Interior of cabinet and door.

FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Miter and weld joints and grind smooth.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed and semirecessed cabinets will be installed and prepare recesses as required by type and size of cabinet and trim style.

B. Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

C. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

D. Identification: Apply decals at locations indicated.

E. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

F. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

3.2 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other scrap for recycling.

END OF SECTION 10 44 13

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SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes portable, hand-carried fire extinguishers and mounting brackets for fire extinguishers.

B. Related Requirements:

1. Division 10 "Fire Extinguisher Cabinets."

1.3 PREINSTALLATION MEETINGS

A. Pre-installation Conference: Conduct conference at Project site.

1. Review methods and procedures related to fire extinguishers including, but not limited to, the following:

a. Schedules and coordination requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Product Schedule: For fire extinguishers. Coordinate final fire-extinguisher schedule with fire-protection cabinet schedule to ensure proper fit and function.

1.5 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.7 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FM Global.

2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire-protection cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Guardian Fire Equipment, Inc.
b. JL Industries, Inc.; a division of the Activar Construction Products Group.
c. Larsens Manufacturing Company.

2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B, and bar coding for documenting fire-extinguisher location, inspections, maintenance, and recharging.

C. Multi-Purpose Dry Chemical Type: UL-rated 4-A:60-B:C, 10 lb. nominal capacity, in enameled steel container, for Class A, Class B and Class C fires.

a. Provide multi-purpose dry chemical type ABC extinguishers except where otherwise noted.

2.3 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red black baked-enamel finish.

1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Guardian Fire Equipment, Inc.
b. JL Industries, Inc.; a division of the Activar Construction Products Group.
c. Larsens Manufacturing Company.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.

1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.

C. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

3.3 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other scrap for recycling.

END OF SECTION 10 44 16

SECTION 11 40 00 - FOODSERVICE EQUIPMENT

PART 1 – GENERAL

1.1 SECTION INCLUDES:

A. Foodservice equipment.

1.2 SCOPE OF WORK:

A. Furnish all labor, materials and services necessary for the procurement and installation of the equipment included in this section. For further information regarding scope of work between trades, refer to the foodservice utility drawings in the Ricca contract documentation set which contain a responsibility matrix identifying contractor vs owner scope of work.

B. Supervise and provide required instructions for work to be performed by other contractors in connection with requirements for all equipment included this section.

C. Specifications and drawings have been prepared to form the basis for coordination with the other trades on this Project, procurement, erection, start up and adjustment of all equipment in this section. Plans and specifications are to be considered as mutually explanatory and work required by one, but not by the other, is to be performed as though required by both. Items required by one, but not by the other are to be provided as though required by both. Work to be accomplished as called for in specifications and shown on drawings, so that all items of equipment are completely functional for purpose for which they were designed. When/if there is any discrepancy between drawings and specifications, bidders should seek clarification of any discrepancies from the Consultant prior to bidding.

D. Should the drawings disagree between themselves or the specifications with the drawings, the better quality more stringent, and/or greater quantity of the work or materials to be completed without additional costs to the Owner.

E. Secure and pay fees for all permits and licenses as required by all authorities having jurisdiction. Give all notices and comply with all laws, ordinances, rules, regulations, and contract requirements bearing on the work.

1.3 RELATED DIVISIONS / SECTIONS:

A. Refer to General Conditions, Supplementary Conditions, and applicable provisions of Division 1 for additional instructions.

B. Refer to Interior Design Divisions for applicable provisions and sections regarding décor finishes, applications, details, and special instructions relating to items specified in this Section. Applicable to Projects with items specified in this Section, with décor finishes and/or construction.

C. Refer to Mechanical/Plumbing Divisions for applicable provisions and sections regarding mechanical services, including, but not limited to exhaust ductwork and fans, floor sinks and floor drains, water gas and steam rough-ins, grease traps, steam traps, drain traps, atmospheric vents, valves, pipes and pipe fittings, ductwork, and other materials necessary to complete final connections to individual items as specified in this Section. Not work of this Section. Also includes:
   1. Piping and insulation for fryer oil systems.
   2. Piping for remote pulping systems.
   3. All exhaust hood or ventilator duct work and fans upstream from the connection position.

D. Refer to Electrical Divisions for applicable provisions and sections regarding electrical services, including, but not limited to, rough-ins, standard voltage and low-voltage wiring, conduit, drop-cords, ceiling-mounted cord reel assemblies, disconnects and other materials necessary to complete final connections to individual items as specified in this Section. Not work of this Section. Also includes:
   1. Installation of light fixtures furnished loose at cold storage rooms.
   2. Connection of cold storage room temperature alarm system to the building security system.
   3. Connection of hood fire suppression system to the building security system.

E. Work included in other Divisions - Provision of all walls, floor and/or ceiling/roof openings, and sealing thereof, as necessary for installation of items included in this section. Not work of this Section. Also includes:
   1. Slab depressions reinforced concrete wearing bed and interior finished floor with coved base at prefabricated cold storage assemblies.
   2. Concrete or masonry platforms with finished top and coved base at perimeter, for raised setting of foodservice equipment: Divisions 03/09.
   3. Slab depressions to receive stainless-steel drain trench liner/grate assemblies provided under this Section.
   4. Wall backing to support all wall-mounted equipment.
   5. Conduit and piping sleeves for soda, beer/liquor, refrigeration, CO_2 and drain lines through building ceilings and floors.

F. Work included in other Divisions - Disconnection of existing equipment to be relocated and/or reused; and removal of existing equipment which will not be reused, as determined, and designated by the Architect in other Divisions. Not work of this Section. ***(Applicable to Projects with existing equipment.)***

1.4 DEFINITIONS:

A. Furnish - Supply and deliver to Project Site, ready for unloading, unpacking, assembly, installation, and similar operations.

B. Install (set in place) - Operations at Project Site including actual unloading, unpacking, assembly, erecting, placing, anchoring, applying, finishing, curing, protecting, cleaning and similar operations, ready for final utility connections by other Divisions as appropriate.

C. Provide - Furnish and install complete, ready for intended use, including any necessary initial training.

D. Contractor - Refers to the Kitchen Equipment (Sub) Contractor in this Section. References to any other Contractor or Division will be specific, such as General

Contractor, Plumbing (Sub) Contractor / Division, Electrical (Sub) Contractor / Division, Architect designated, etc.

1.5 LAWS, ORDINANCES, REGULATIONS AND STANDARDS:

A. Comply with the following in their current published form:

1. Air Conditioning and Refrigeration Institute (A.R.I): applicable regulations and references of the latest edition of standards for remote refrigeration system(s), components and installation.
2. American Gas Association (A.G.A.): standards for gas heated equipment and provide equipment with the A.G.A. seal. Automatic safety pilots to be provided on all equipment, where available. (Canadian Gas Association or alternate testing lab's seals accepted if acceptable to local code jurisdictions.)
3. American National Standards Institute (A.N.S.I.): Z21-Series for gas-burning equipment. Provide labels indicating name of testing agency.
4. American National Standards Institute (A.N.S.I.): B57.1 for compressed gas cylinder connections, and with applicable standards of the Compressed Gas Association for compressed gas piping.
5. American National Standards Institute (A.N.S.I.): A40.4 and A40.6 for water connection air gaps and vacuum breakers.
6. American Society of Heating, Refrigeration and Air Conditioning Engineers (A.S.H.R.A.E.): applicable regulations and references of the latest edition of standards for exhaust system planning including A.S.H.R.A.E. 90.1 Section 5,6,7, and remote refrigeration system(s), components and installation.
7. American Society of Mechanical Engineers (A.S.M.E.): Boiler Code requirements for steam generating and steam heated equipment and provide A.S.M.E. inspection stamp and registration with National Board.
8. American Society for Testing and Materials (A.S.T.M.): C1036 for flat glass.
9. American Society for Testing and Materials (A.S.T.M.): C1048 for heat-treated flat glass - Kind HS, Kind FT coated and uncoated glass.
10. American Society for Testing and Materials (A.S.T.M.): F232-03 for pre-rinse spray units, and in compliance with Energy Policy Act of 2005 (EPAct).
11. American Welding Society (A.W.S.): D1.1 structural welding code.
12. Energy Policy Act of 2005 (EPAct 2005): water savings pre-rinse spray valves.
13. National Electric Code (N.E.C.): N.F.P.A. Volume 5 for electrical wiring and devices included with foodservice equipment, A.N.S.I. C2 and C73, and applicable N.E.M.A. and N.E.C.A. standards.
14. National Electrical Manufacturers Association (N.E.M.A.): LD3 for high-pressure decorative laminates.
15. National Fire Protection Association (N.F.P.A.): applicable sections for exhaust hoods, ventilators, duct and fan materials, hoods fire suppression systems, wheel placement systems, construction and installation; in addition to local codes and standards.
16. National Sanitation Foundation (NSF): latest Standards and Revisions, and as accredited by ANSI, IAS, NELAC, ISO, OSHA and SCC. Provide NSF Seal of Approval on all standard manufactured items included in this Project and listed in any NSF Certified Food Equipment Products Category, and on all items of custom fabricated work included in this Project. (UL Sanitation approval and seal accepted if acceptable to local code jurisdictions.)
17. Sheet Metal and Air Conditioning Contractor's National Association (S.M.A.C.N.A.): latest edition of guidelines for seismic restraint of kitchen equipment, as applicable to project location. All seismic requirements shall be shown on all submittals. Submit requested information to the agencies and

authorities having jurisdiction.

18. Underwriters Laboratories (U.L.): as applicable for electrical components and assemblies. Provide either U.L. labeled products or, where no labeling service is available, “recognized markings” to indicate listing in the U.L. “Recognized Component Index”. (Canadian Standards Association or alternate testing lab's seals accepted if acceptable to local code jurisdictions.)
19. UL 300 Standard: for wet chemical fire suppression systems for exhaust hoods/ventilators.
20. American with Disabilities Act (ADA): as applicable to this Project.
21. Refrigeration Service Engineers Society (R.S.E.S.): applicable regulations and references of the latest edition of standards for remote refrigeration system(s), components and installation.
22. All refrigerants used for any purpose is to comply with the 1995 and 2010 requirements of the Montreal Protocol Agreement, and subsequent revisions and amendments. No CFC or HCFC refrigerants will be permitted on this Project.
23. All refrigeration components installation, repairs, and/or associated work on any refrigeration system, is to be performed by a Certified Refrigeration Mechanic thoroughly familiar with this type of commercial foodservice installation. ETL and other national and international recognized Testing and Listing Agency labels and certifications are acceptable in lieu of Listing Agencies indicated in these documents, if acceptable to the local code jurisdictions.
24. All applicable local codes, standards, and regulations.
25. All special local codes, standard, and regulations, such as (examples only) California Energy Commissions Regulations, Dade County requirements for walk-in cooler(s) and/or freezer(s).
26. For detention facilities projects (as applicable): applicable Correctional Standards. Verify the level of security and construction required with the Architect and provide all items in compliance.

B. The Contract Documents shall prevail whenever they require larger sizes or higher standards than are required by regulations.

C. The above regulations shall govern whenever the Contract Documents require something that is deemed to violate the above regulations.

D. No extra charge will be paid by Owner for furnishing items required by the regulations, but not specified and/or shown on the drawings.

E. Rulings and interpretations of the enforcing agencies shall be considered part of the regulations.

1.6 CONTRACTOR’S QUALIFICATIONS:

A. In addition to requirements of Related Sections 1.3.A:
1. Five (5) years minimum continuous operation under the same company name and ownership.
2. Financial stability and ability to complete this Project.
3. Comparable size and scope projects completed in the last five (5) years.
4. Contractor to provide letter that states they are able-to purchase, distribute, and install all items specified.

B. Any sub-contractor or fabricator employed by Contractor:
   1. Is to comply with the same qualifications.
   2. Their name, address, and a brief-summary of their experience and qualifications is to be submitted with the bid proposal.
   3. Fabrication sub-contractor shall be NSF, NEC, and UL-approved at a minimum for fabrication of all items detailed within this specification and attending drawing set. Moreover, fabrication shop shall have the means and expertise to fully engineer and fabricate any-and-all counters, tables, natural and man-made stone counter tops, food shields, etc. all in one manufacturing facility where specified as part of this document set.
   4. Approved fabricators include the following:

      -

      -

      -

1.7 BIDDING AND SUBSTITUTIONS:

A. The Bidder shall provide pricing on primary manufacturer and model specified. These Contract Documents were designed and engineered using the primary manufacturer and model and are intended to be the Basis of Bid. Provide itemized prices for each item, along with cited accessories with separate total prices for delivery and installation. Any-and-all city, state, occupational and government taxes which are applicable to this project, shall be included and added as a separate charge. All figures shall be included in a grand total package bid proposal. Bids shall be valid for thirty (30) days after bid deadline date and shall indicate same. Failure to comply with the above may be cause for rejection of the bid.

B. Unless otherwise noted, substitutions may be submitted for consideration, but must be itemized at the end of the bid proposal.

C. Substitutions must be approved in writing by the Architect and/or Owner, prior to utilization in this Contract. A copy of the approval must be included with any submittals by Contractor.

D. Contractor shall provide all design/engineering services required to make-adjustments in space, systems, utilities, etc. and pay all additional costs of utilities, construction or professional services that may be incurred due to the acceptance of any substitution.

E. Application for Substitution of Specified Foodservice Equipment. This form shall be submitted in support of each suggestion of request to substitute an alternate manufacturer and/or model of equipment that is not included in the Division 11 40 00 (Foodservice Equipment) specifications.

APPLICATION FOR SUBSTITUTION OF SPECIFIED FOODSERVICE EQUIPMENT

The decision to accept an unnamed alternate will be based exclusively on the information provided hereon and the Owner's or their designee's research and verifications of claims, which shall include sharing the information with manufacturer(s) of the originally specified equipment. Accordingly, any proprietary information regarding the proposed substitution should be so identified and submitted as an addendum to this form.

By submitting this application, the Contractor guarantees the information is correct and accepts total responsibility for all additional costs that may directly or indirectly result from acceptance of the proposed substitution. It is the interest of the Contractor to declare in this form all benefits that they may accrue to the Owner. Include the proposed manufacturer's data sheets, drawings, and any other supporting information.

The original specifications describe the minimum standards of the equipment – proposed substitutions that do not meet or exceed this minimum standard or otherwise benefit the Owner will not be considered except in the case of an originally specified item that is no longer available. The Owner or their designee will be the sole authority regarding identifying specific features, capacities, etc. that are operationally critical. Acceptance of a proposed substitution does not relieve the Contractor of responsibility for all direct or indirect costs associated with the substitution.

1. Date Submitted: _____
2. Item Number:_____ Description:_____ Quantity:_____
3. Specified Manufacturer:_____ Specified Model Number:_____
4. Proposed Manufacturer:_____ Proposed Model Number:_____
5. Does the proposed equipment incorporate all features and options expressed or implied by the specifications, including features and option that are provided as standard by the specified item?

   ☐ Yes ☐ No – describe (attach additional sheets as required):_____

   _____

   _____

6. Compare Utilities (attach additional sheets as required):

   Specified: HW_____ CW_____ Gas (BTU) _____ Steam (BHP) _____ Electrical_____

Exhaust (cfm) _____ Duct size_____ Supply (cfm) _____ Duct size_____

_

Proposed: HW_____ CW_____ Gas (BTU) _____ Steam (BHP) _____ Electrical_____

Exhaust (cfm) _____ Duct Size_____ Supply (cfm) _____ Duct Size_____

7. Compare Dimension:

Specified: Left to Right_____ Front to Rear_____ Height_____

Proposed: Left to Right_____ Front to Rear_____ Height_____

8. Does the proposed substitution require changes to the work to be provided by other trades?

☐ No ☐ Yes – describe (attach additional sheets as required):_____

_____

_____

9. Does the proposed substitution require changes or create any issues regarding adjacent or associated equipment (for instance: door swing interference; service access; air circulation)?

☐ No ☐ Yes – describe (attach additional sheets as required):_____

_____

_____

What benefits will the Owner realize as a result-of this substitution (for instance: capital expense; energy savings, flexibility)? Provide specific information.

☐ There are no benefits to the Owner.

☐ The following will benefit the Owner – (attach additional sheets as required):_____

_____

_____

10. Are there any other considerations that should be evaluated? _____

_____

_____

11. Signature of Contractor's Representative: _____

1.8 APPROVED SUBSTITUTIONS AND/OR LISTED ALTERNATES:

A. Substitutions approved as noted in Article 1.7, and/or any Listed Alternate manufacturers included in the Itemized Specifications Article 3.12, or added by Addendum, may be utilized, in lieu of the primary specified manufacturer with the following conditions:

1. These Contract Documents are designed and engineered using the primary specified manufacturer and model and are intended to be the Basis of Design and Bid. Contractor assumes complete responsibility for any deviations required due to utilization of a substitution/alternate manufacturer or model; including, but not limited to, fitting alternates into available space, providing directions for required changes, and assuming any associated cost for utility, building, architectural, or engineering changes.
2. Contractor is responsible for supplying the model, which is as close as possible to the primary specified model in regard-to general function, features, options, sizes, accessories, utility requirements, finish, operation, internal system engineering and listing approvals. if it is determined by the owner or their appointed representative at any time during the construction and installation process, and prior to the final acceptance of the Project, that the substitution/alternate model submitted is not equivalent to the primary specified model, the Contractor will assume all associated cost and implications required to replace the model submitted, with the correct model.
3. The bid proposal is to clearly state any proposed substitutions/alternates, that are being offered for review by including the manufacturer and model number. Along with a current data sheet for each substitution/alternate, with any-and-all deviations between the primary specified manufacturer and the substitution/alternate manufacturer clearly defined. Technical brochures from manufacturers may not be acceptable as adequate information required for comparison. Complex alternates such as utility distribution systems, exhaust hoods, ventilators, refrigeration systems, etc., shall include a shop drawing specific to this Project.
4. Inclusion of an alternate manufacturer in Itemized Specifications Article 3.12 is not intended to indicate that there is an equal alternate unit to match every primary specified unit. It is the responsibility of the Contractor to ensure that the alternate unit submitted matches or exceeds the primary specified unit; and meets the conditions as stated above.
5. Manufacturers not approved as substitutions or included as a Listed Alternates will not be permitted.

1.9 DISCREPANCIES:

A. Where discrepancies are discovered between the drawings and the specifications, regarding quality or quantity, the higher quality or the greater quantity is to be included in the Bid Proposal.

B. Contractor to notify the Architect, in writing, of any discrepancies discovered; and await written clarification prior to proceeding with the items or areas in question.

C. Contractor is responsible for verifying and coordinating all items provided in this Section, with the drawings, specifications, manufacturer’s requirements, submittals, actual site conditions, adjacent items, and associated (Sub-) Contractors; to assure that there are no discrepancies or conflicts. This is to include, but not be limited to, quantities, dimensions, clearances required, direction of operation, door swings, utilities, fabrication details and methods, installation requirements, etc.

1.10 SUBMITTALS:

A. Provide one (1) digital set (PDF) of all Submittals for review by the Design Team. After review process this set will be returned for any updating necessary and subsequent distribution.

B. Substitutions must be approved in writing by the Architect and/or Owner prior to utilization in this contract. A copy of the approval must be included with any submittals.

C. Contractor to review all submittals for compliance with the Contract Documents, prior to submitting to the Design Team for review and is responsible for the accuracy of the information within their submittals.

D. Contractor's use of any Design Team's digital contract drawings for basis of producing their submittal drawings, is limited to the following conditions, and understanding:
   1. Contractor shall perform a thorough project review of all foodservice and allied discipline (MEPS) documents within the Contract Document set and provide independent engineering for all equipment to be provided. Contractor shall assume complete liability and responsibility for accuracy, and for conformance and verification with the latest Architectural and Engineering drawings, actual field conditions and equipment to be provided as part of contract.
   2. The copy and simple re-use of the foodservice consultant's equipment plans, connection plans, building conditions plans, manufacturer's drawings, elevations/sections are prohibited.
   3. Contractor further assumes responsibility for coordination of their submittals with those of other allied Contractors and Sub-Contractors, such as electrical, plumbing, and mechanical contractors as required.
   4. Submittals shall contain Contractor's notes, symbols, details, title block and information.

E. Equipment Plan and Rough-In Drawings:

   1. Submit 1/4" (1:50) scale drawings in pdf format. These drawings are to include complete information on the work included in this Contract, with references to equipment as provided by others; and are to provide sufficient information for associated trades, contractors, and/or sub-contractors to complete their division of work associated with foodservice equipment included in this Contract. Include any additional information pertinent to the installation of this equipment.
   2. Special Conditions Drawings, dimensioned, sizing and locating the following conditions:
      a. Slab depressions, cores, sleeves, or block-outs (cold storage assemblies drain trenches, piping, etc.).
      b. Concrete or masonry platforms.
      c. Pipe sleeves or roof jacks.
      d. Wall-openings or block-outs for pass-through equipment, recessed control panels, in-wall fire-protection system components, etc.
      e. Blocking grounds or anchor plates required in walls for equipment support/attachment.
      f. Above-ceiling hanger assemblies for support of exhaust hoods, utensil-racks, etc.
      g. Access panels in walls or ceiling for service of equipment.
      h. Ceiling pockets or recesses for unusually high equipment.
      i. In-wall carriers for wall-hung or cantilevered equipment.

j. Ventilation for exhaust hoods, condensate hoods, ice machines, compressors, compressor racks and all other equipment requiring heat removal.
k. Support systems such as beverage conduit and refrigeration line-run sleeves.
l. Any other additional information pertinent to the installation of this equipment.

3. Electrical Rough-in Drawings field-coordinated and dimensioned providing the following information, but not limited to:
   a. Electrical utility schedule.
   b. Locations of rough-ins.
   c. Locations of control panels.
   d. Inter-wiring of walk-in freezer compressors to compressor rack control panel for defrost cycle.
   e. Inter-wiring of controls panels to equipment.
4. Plumbing Rough-In Drawings field-coordinated and dimensioned providing the following information, but not limited to:
   a. Plumbing utility schedule.
   b. Locations of rough-ins.
   c. Interconnection water filters assemblies to ice machine, beverage equipment, combi-ovens, steamers, etc.
5. Field-coordinated, dimensioned refrigeration line-run drawings providing the following information, but not limited to:
   a. Sleeve locations & sizes for walls, floors, ceilings.
   b. Detailed and field-coordinated route of refrigeration line-runs from remote refrigeration system to unit served.
   c. Location and inter-wiring detail required for any temperature monitoring and/or control system specified.
6. Drawings to also include equipment plan(s) with detailed equipment list, similar-to Foodservice Equipment Plans included in the Contract Drawings. Item numbers are to be the same as shown in the Contract Documents and are to include Spare Numbers and associated items provided by others.
7. In the event rough-ins have been accomplished before award of this contract, Contractor is to examine the existing facility and identify adjustment needs related to their equipment to suit building conditions and utilities, where possible. Contractor to seek approval for the same prior to further construction. If not possible, state so in a letter, with reasons and an alternate method and pricing for their equipment, to the Architect and Foodservice Consultant.

F. Shop Drawings:
1. Submit shop drawings for items of custom fabrication included in this contract in pdf format. Shop drawings are to be submitted at 3/4” (1:20) and/or 1-1/2” (1:10) scale and are to show dimensions, materials, finishes, details of construction, installation and relation of adjoining work requiring cutting or close fitting as well as any specified fabrication shop fit-out work such as electrical load circuit breaker panels, inter wiring or inter-piping. Shop drawings are to also indicate reinforcements, anchorage and related work required for the complete installation of fixtures. Fabricator’s shop drawings shall be prepared as a coordinated single submittal, separate-from, and not part of a single collated foodservice submittal.
2. Submit shop drawings for any equipment requiring field assembly, including but not limited to, Suite-style cooking assemblies, pulper/extractor assemblies, remote refrigeration systems, walk-in coolers and/or freezers, exhaust hoods/ventilators, fire suppression system, utility distribution systems,

pot/utility/cart/tray/ware washing assemblies/machines, conveyors, floor troughs, seismic anchoring details (as required) and fresh oil supply/waste oil recovery systems in pdf format. Manufacturer's shop drawings shall be separated per system submitted in single form, and not part of a collated foodservice submittal.

3. When applicable, prepare and submit section, elevation, axonometric drawings in PDF format for all food shields within counters in a coordinated single submittal. Food shields to be compliant with current NSF code requirements and ergonomic reach requirements. Contractor to provide physical mock-up of same for Owner/Operator review and sign-off prior to fabrication.
4. Before proceeding with the fabrication or manufacture of any item, Contractor is responsible for verifying and coordinating all dimensions and details with site dimensions, conditions, and adjacent equipment.
5. The Contractor to clearly identify on drawings any-and-all differences between the Bid and/or Contract Documents and what is being provided. If any structural, electrical, plumbing, gas or steam requirements are different than what the Bid and/or Contract Documents show the Contractor will notify and record on the drawings identifying what is different and discuss same with General Contractor, Owner and Foodservice Consultant prior to commencing work.

G. Product Data Submittal Manuals:

1. Submit product data brochure(s) with a cover sheet complete with detailed information on every item included in this section in pdf format. Detailed information is to include, but not be limited to, item number, description, quantity, model numbers, options and accessories provided, N.E.M.A. plug and receptacle configuration for applicable items, exact utility requirements, manufacturer's cut-sheets, reference to specific shop drawings, etc. Distribute one additional copy of installation and start-up instructions to the Installer. Every cover sheet and associated detailed submittal is to provide sufficient and complete information for the Design Team to verify that the Contractor understands the Contract requirements and is providing each item in compliance with the Contract Documents. Cover sheets to also include associated items as listed on the Equipment Plan but provided by others; and are to be noted as "Not in Section 11 40 00 Contract Division".
2. Reproduction of any part of the Contract Specifications will not be acceptable as part or total of Contractor's Product Date Submittal Manuals. These Manuals are to be produced and assembled entirely by the Contractor, in numerical order according to Item numbers.
3. The cover sheet shall clearly identify all differences between the bid documents and what is being provided. If any electrical, plumbing, gas or steam requirements are different than what the bid documents show the Contractor will make a note on the coversheet identifying what is different and why. If a model has been discontinued, the Contractor will make a note on the cover sheet and offer a replacement model.
4. The cover sheet shall clearly identify all differences between the Bid/Contract Documents and what is being provided. If any electrical, plumbing, gas or steam requirements are different than what the bid documents show the Contractor will make a note on the coversheet identifying what is different and why. If a model has been discontinued, the Contractor will make a note on the cover sheet and offer a replacement model.

H. The Design Team's review of submittal drawings, shop details, product data brochures, and operation and maintenance manuals are for general conformance with the design concept and Contract Documents. Review markings or comments are not to be

construed as relieving Contractor from compliance with the Contract Documents, or departures there from. Contractor remains responsible for details and accuracy, confirming and correlating all quantities and dimensions, selecting fabrication processes, techniques of assembly, and performing their work in a safe, satisfactory, code-compliant and professional manner.

I. Commencement of purchasing or fabrication by the Contractor, of any item(s) included in this Contract, prior to receipt of reviewed Submittals from the Design Team, shall be at the Contractor's own risk; unless specifically instructed to do so in writing by the Owner, including the specific item numbers requested.

J. Contractor shall verify requirements and equipment sizes, critical clearances, or other characteristics necessary to represent Owner/ Purveyor items completely on the shop drawing submittals even though they may be listed as "NIC/Not in Contract" in the Equipment Schedule/Item Specification sections of this document.

1.11 OPERATION AND MAINTENANCE DATA MANUALS:

A. Two (2) bound sets of manuals are to be furnished for items of standard manufacturer on/or before the date of the first event to occur of the following: demo/start-up, start-up for intended use by the Owner/Operator, completion of installation of kitchen equipment contract package, or final acceptance of installation by Owner. Manuals are to be in alphabetical order according to manufacturer. Manufacturer's info is to include Tech Services telephone number, email, and web site address, where available.

B. Provide a complete list of all equipment, with make, model and serial numbers. Provide list of local service agencies for included manufacturers, complete with addresses, email addresses and telephone numbers. Also provide email and web site addresses, where available.

C. Provide electronic/digital media for maintenance, training, operation, etc. where available from the manufacturer.

D. Manual shall also include a leak testing report for each-and-every remote refrigerated system included under this Foodservice Equipment Section, as required in article 2.7.A.6 Refrigeration Equipment of this Section.

1.12 AS - BUILT/ RECORD DOCUMENTS:

A. Maintain one record set of Foodservice Equipment Plans with any related corrections, revisions, additions, deletions, changes, etc. noted during construction and installation. Provide an "as-built" set on a computer disk or electronically in PDF format.

B. Provide one (1) final set of Product Data Submittal Manual with any related corrections, revisions, additions, deletions, changes, etc. noted during construction and installation as a specifications' record set electronically in PDF format.

C. These documents are to be provided at the same time as the O & M Data Manuals. Submit the O & M Data Manuals electronically in PDF format.

1.13 SCHEDULE:

A. Time is of the essence and acceptance constitutes assurance that the Contractor can and will obtain materials, equipment and manpower, to permit installation of the items included in this Section, on schedule. Contractor is to coordinate their work with the progress schedule, as prepared and updated periodically by the General Contractor or Construction Manager.

B. Anticipated delays, not within the control of the Contractor, are to be noted in a written notification to the Architect, immediately upon the Contractor's realization that delays are imminent.

C. Failure of manufacturers to meet promised delivery dates will not grant relief to the Contractor for failure to meet schedules; unless the Contractor can establish, in writing, that orders were received by the manufacturer, with reasonable lead times.

D. Extra charges resulting from special handling or air shipment in-order-to meet the schedule will be paid by the Contractor if insufficient time was allowed in placing factory orders.

1.14 WARRANTY:

A. Unless otherwise noted in Related Divisions / Sections 1.3.A, items furnished are to be fully guaranteed against defects in workmanship, materials, and functionality for one full year from the date of the first event to occur of the following: date of issue of Certificate of Occupancy (or the equivalent), start-up for intended use by the Owner/Operator, completion of installation of kitchen equipment contract package, or final acceptance of installation by Owner. Should a Temporary Certificate of Occupancy be issued for partial completion of work, the items furnished within that designated area are to be under warranty from the date of issue of that Certificate. Contractor or their service agent will make necessary repairs and replacements without charge to the Owner, and within a reasonable time.

B. Additional Refrigeration Warranty: in addition to the one-year warranty requirements as stated above, provide start-up and parts and labor for the first year, plus additional four-year extended warranty on compressors. Extended warranty is for provision of replacement compressor, determined to be defective by a certified refrigeration mechanic. However, verification of defective compressor, installation of replacement compressor, recharging and repairs of system will be the responsibility of the Owner. This includes all items with built-in or remote refrigeration system.

C. Periodic routine maintenance, servicing, adjustments, cleaning, etc., as required by the manufacturers included in this Project, are the responsibility of the Owner.

D. Any-and-all parts or requirements for manufacturer’s warranties to be in effect, whether, or not noted in the itemized specifications, are to be provided or complied with by the Contractor. This is to include, but not be limited to, particular-parts, accessories, or installation; installation supervision, start-up, and/or follow-up inspections required by factory trained, Certified, and/or authorized personnel. Factory training, Certification, and/or authorization is to be in effect at the time of bidding, installation, start-up, and warranty period of this Project.

E. Unless otherwise noted in Related Divisions manufacturer's warranties which comply with the requirements of this Warranty Article 1.14, are to be provided in lieu of Contractor's own warranties, where available. Copies of the written warranties are to be included in the O & M Manuals.

PART 2 – PRODUCTS

2.1 EQUIPMENT:

A. Refer to schedule on Foodservice Drawings and Section 3.12 Itemized Specifications for equipment included in this Section.

2.2 MATERIALS:

A. Metals:
1. Stainless-Steel: AISI Type 201 or 302/304, hardest workable temper, and No.4 directional polish. Unless otherwise noted or specified, or required by the manufacturer, 201 may be used wherever 302/304 is listed.
2. Galvanized Steel Sheet: ASTM A526, except ASTM A527 for extensive forming; ASTM A525, G90 zinc coating, chemical treatment.
   a. Where painted finish is indicated, provide mill phosphatized treatment in lieu of chemical treatment.
3. Steel Sheet: ASTM A569 hot-rolled carbon steel.
4. Galvanized Steel Pipe: ASTM A53 or ASTM A120, welded or seamless, schedule 40, galvanized.
5. Steel-Structural Members: Hot rolled or cold formed, carbon steel unless stainless-steel is indicated.
   a. Galvanized Finish (G.I.): ASTM A123 hot-dipped zinc coating, applied after fabrication.
6. Aluminum: ASTM B209/B221 sheet, plate, and extrusions (as indicated); alloy, temper and finish as determined by manufacturer/fabricator, except 0.40-mil natural anodized finish on exposed work unless another finish is indicated.

B. Plastic Laminate: NEMA LD3, Type 2, 0.050" (1.27 mm) thick, except Type 3, 0.042" (1.07 mm) for post- forming smooth (non-textured). Color and texture as selected by Architect/ Interior Designer.
1. Comply with NSF Standard No. 35.
2. Veneered with approved waterproof and heat proof cement. Rubber base adhesives are not acceptable.
3. Applied directly over close grained plywood, such as solid Mahogany or solid Birch, of selected, smooth, sanded stock to ensure a smooth ripple-free laminated surface; or commercial grade furniture particle board, Cortron or equal.
4. Exposed faces and edges are to be faced with 1/16" (1.6 mm) thick material. Corresponding backs are to be covered with approved backing and balancing sheet material.

C. Millwork: No unfinished millwork, plywood/particle board or wood framing (including backs, undersides, and all surfaces concealed from view) will be permitted. All unfinished surfaces or openings cut through finished surfaces are to be sealed to be water resistant; with excess plastic laminate material, Cortron (Melamine) material, backing materials, sealers, primers, finish paint, etc., to blend with specified finish materials.

D. Hardwood Work Surfaces: Laminated edge grained hard maple (Acer saccharum), NHLA First Grade with knots, holes and other blemishes culled out, kiln dried at 8 percent or less moisture, waterproof glue, machined, sanded, and finished with NSF approved oil-sealer.

E. Solid Surface Material and Simulated/Engineered Stone:
1. Single-Source Responsibility for Solid Surface Material and Simulated/Engineered Stone: Obtain each color, grade, finish, type, and variety of material or stone from a supplier with resources to provide materials of consistent quality in appearance and physical properties, including the capacity to cut and finish material without delaying the progress of the work.
2. Single-Source Responsibility for Other Materials: Obtain each type of solid surface material and simulated/engineered stone accessory, sealant, and other materials from one manufacturer for each product.
3. Installer Qualifications: Trained and approved by countertop manufacturer who has completed countertops similar in material, design, and extent to that indicated for project that has resulted in construction with a record of successful in-service performance.
4. The Contractor is responsible for verification of delivered stone materials for quantities, defects, or damage within [ten (10) days] after delivery. No compensation will be allowed to the contractor for materials and labor that may be required to replace materials after this time-period.
5. Allowable Tolerances:
   a. Variation in component size: +/- 1/8 inch (3 mm) in 8 feet (2.4 m).
   b. Maximum height of abrupt irregularities: 1/32 inch (.8 m).
   c. Location of openings: +/- 1/8 inch (3 mm) from indicated location.
6. Do not deliver countertop materials until painting and similar operations that could damage engineered stone materials have been completed in installation areas. If engineered stone materials must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.
7. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent physical damage or staining following installation for duration of project.
8. Environmental Limitations: Do not deliver or install simulated stone materials until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
   a. Maintain ambient temperature between 50 and 95 degrees F. for 48 hours before, during and for minimum 7 days after installation.
9. Field Measurements: Where simulated stone materials are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
   a. Locate concealed framing, blocking, and reinforcements that support simulated stonework by field measurements before being enclosed and indicate measurements on Shop Drawings.
10. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.
11. Adhesive and Sealant as recommended by engineered stone manufacturer.

12. Sink/bowl mounting hardware:
    a. Manufacturer's approved bowl clips, brass inserts and fasteners for attachment of under-mount sinks/bowls.
13. Fabrication:
    a. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer's printed instructions. Clean surfaces to remove loose and foreign matter that could impair adhesion.
    b. Remove ridges and projections. Fill voids and depressions with patching compound compatible with setting materials.
    c. Shop cut openings, to maximum extent possible, to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings.
    d. Rout and finish component edges with clean, sharp returns. Rout cutouts, radii and contours to template. Smooth edges. Repair or reject defective and inaccurate work.
    e. Provide materials with ample allowance for cutting, when required to cut and fit on site. Provide trip for scribing and site cutting.
    f. Thickness: Provide thickness indicated, but not less than the following:
        i. Countertop: [3/4] (19 mm) [1-1/4] inch[es] (32 mm)
        ii. Back and End Splashes: 3/4 inch (19 mm), unless shown otherwise.
        iii. Substrate: [3/4] (19 mm)

F. Stone:
1. Single-Source Responsibility for Stone: Obtain each color, grade, finish, type, and variety of stone from a supplier with resources to provide materials of consistent quality in appearance and physical properties, including the capacity to cut and finish material without delaying the progress of the work.
2. Single-Source Responsibility for Other Materials: Obtain each type of stone accessory, sealant, and other materials from one manufacturer for each product.
3. Installer Qualifications: Engage an experienced installer who have completed stone countertops similar in material, design, and extent to that indicated for project that has resulted in construction with a record of successful in-service performance.
4. The Contractor is responsible for verification of delivered stone materials for quantities, defects, or damage within ten (10) days after delivery. No compensation will be allowed to the contractor for materials and labor that may be required to replace materials after this time-period.
5. Allowable Tolerances:
    a. Variation in component size: +/- 1/8 inch (3 mm) in 8 feet (2.4 m).
    b. Maximum height of abrupt irregularities: 1/32 inch (.8 mm).
    c. Location of openings: +/- 1/8 inch (3 mm) from indicated location.
6. Granite materials shall not contain unsafe levels of radioactive materials.
7. Do not deliver countertop materials until painting and similar operations that could damage stone materials have been completed in installation areas. If stone materials must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.
8. Deliver materials to project site in undamaged condition.
9. Store and handle stone and related materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, breakage, chipping, or other causes.

a. Do not use pinch or wrecking bars.
b. Lift with wide-belt-type slings where possible. Do not use wire rope or ropes containing tar or other substances that might cause staining. If required to move stone, use wood rollers with cushions at end of wood slides.
c. Store stone on wood skids or pallets covered with non-staining, waterproof membrane.
d. Place and stack skids and stones to distribute weight evenly and to prevent breakage or cracking of stones.
e. Protect stored stone from weather with waterproof, non-staining covers or enclosures, but allow air to circulate around stones.
f. Store cementitious materials off the ground, under cover, and in dry location.

10. Environmental Limitations: Do not deliver or install stone materials until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
    a. Maintain ambient temperature between 50 and 95 degrees F. for 48 hours before, during and for minimum 7 days after installation.
11. Field Measurements: Verify dimensions of construction to receive stone countertops by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the work.
    a. Established Dimensions: Where field measurements cannot be made without delaying the work, establish dimensions and proceed with fabricating countertops without field measurements. Provide allowance for trimming at site and coordinate construction to ensure actual dimensions correspond to established dimensions.
12. Comply with referenced standards and other requirements indicated applicable to each type of material required.
13. Provide matched slabs, coordinated for each type, variety, color, and quality of stone required.
14. The use of colored tints, dyes, or waxes applied to stone shall NOT be permitted.
15. Granite:
    a. Granite Building Stone Standard: ASTM C615, free from cracks, chips, stains, or other defects, uniform in tone and coloring.
16. Marble:
    a. Marble Building Stone Standard: ASTM C503, free from cracks, chips, stains, or other defects, uniform in tone and coloring.
17. Adhesives:
    a. Stone Seam Adhesive: 2-part, epoxy or polyester stone adhesive formulated specifically for bonding stone to stone, with an initial set time of not more than 2 hours at 70 deg F.
    b. Water-cleanable Epoxy Adhesive: ANSI A118.3, water-cleanable, tile-setting epoxy adhesive.
    c. Color: Clear
    d. Use installation adhesives that have a VOC content 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), or as listed in VOC limit tables in Section 01 81 19 “Indoor Air Quality Requirements”. Products furnished shall comply with whichever VOC content requirement is more stringent.
18. Stone Sealants:
    a. Sealant for Countertops: Clear silicone sealant complying with

requirements of Section 07 92 00 "Joint Sealants".

b. For sealants used inside of the vapor barrier, provide sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), or as listed in VOC limit tables in Section 01 81 19 “Indoor Air Quality Requirements”. Products furnished shall comply with whichever VOC content requirement is more stringent.

19. Stone Sealers:
    a. Penetrating Sealer: Penetrating sealer that protects the exposed faces of stone and grout from staining. Sealer shall be UV transparent; non-yellowing; VOC compliant; mold and mildew resistant; and USDA approved as safe on food handling surfaces. Material shall exceed ADA standards for slip resistance at traffic areas.
    b. For sealers used inside of the vapor barrier, provide sealers that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), or as listed in VOC limit tables in Section 01 81 19 “Indoor Air Quality Requirements”. Products furnished shall comply with whichever VOC content requirement is more stringent.
20. Cutouts and Holes for Lavatories, Sinks, and Fittings:
    a. Undercounter Lavatories: Make cutouts for undercounter lavatories in shop using template or pattern furnished by lavatory manufacturer. Form cutouts to smooth, even curves with edges at right angles to top. Ease juncture of cutout edges with tops, and finish edges to match tops.
21. Fittings: Drill countertops in shop for plumbing fittings, undercounter soap dispensers, and similar items.

G. Insulation:
1. For low temperature applications, such as ice bins, cold pans, or fabricated under counter freezers, use urethane, rigid board foam or foamed-in-place; not less than 2” (50 mm) thick, except that vertical surfaces of cold pans and ice bins may be 1” (25 mm) thick. Insulation to be bonded at joints, to prevent condensation on exterior.
2. For refrigerated applications such as fabricated under counter refrigerators, use urethane rigid board foam or foamed-in-place, or Styrofoam rigid board foam 2” (50 mm) thick, bonded at joints. No fiberglass insulation will be permitted.
3. For heated type applications, such as plate warmers, use block type rock wool, minimum 1” (25 mm) thick; or Marinite I as noted in #4 below.
4. At counters with tops subject to direct or indirect heat from heating or cooking-equipment, provide heat-resistant, food-safe caulking, three (3) layers of Nomex insulation held-in-place with aluminum tape. Provide a 1/8” (3 mm) minimum space between the heat source and the insulation. Coordinate drop-in equipment flange support and provide a 16-gauge stainless-steel 90-degree angle collar.
5. All insulation is to be fully encased or enclosed in 16-gauge (1.6 mm) stainless-steel.

H. Joint Materials:
1. Sealants: waterproof and mildew resistant silicone sealant, with Shore A hardness of 30, except 45 if subject to traffic, and minimum service temperature range of -60º to +400º F. Sealant to be NSF Standard #51 Listed, and FDA and USDA Approved for use in food zones. Surfaces, cleaning, and sealants installation to comply with applicable requirements of FDA, USDA, and NSF Standards, and accepted foodservice installation practices.
2. Backer Rod: For 3/8” (9.5 mm) or larger joints, to be polyurethane rod stock, larger than joint width.

3. Gaskets: Solid or hollow (but not cellular) neoprene or polyvinyl chloride; light grey, minimum of 40 Shore A hardness, self-adhesive or prepared for either adhesive application or mechanical anchorage.

I. Paint and Coatings:
1. Provide the types of painting and coating materials which, after drying or curing, are suitable for use in conjunction with foodservice, and which are durable, non-toxic, non-dusting, non-flaking, mildew resistant, and comply with NSF Standards and governing regulations for foodservice.
2. Galvanize Repair Paint: MIL-P-21035.
3. Sound Deadener: NSF-listed sound deadening material such as latex sound deadener, for internal surfaces of metal work, and underside of metal counters and tables between work top and underbracing. Verify sound deadening requirements or restrictions with local health authorities.
4. Pretreatment: SSPC-PT2 or PT3, of FS TT-C490.
5. Primer Coating for Metal: FS TT-P-86, type suitable for baking, where indicated.
6. Enamel for Metal: Synthetic type, FA TT-P-491, type suitable for baking, where indicated.

2.3 FABRICATED PRODUCTS:

A. Hardware (also refer to article 2.4 Fabrication of Metal Work in general, and paragraphs O. Doors 1-3 and P. Drawer Assemblies 1-6 specifically, for additional requirements):
1. General: Manufacturer's standard, but not less than ANSI 156.9 Type 2 (Institutional), satin finish stainless-steel or dull chrome finish on brass, bronze, or steel.
2. Hinged Door Hardware: Stainless-steel hinged doors to be mounted with heavy duty NSF-approved hinges with Component Hardware Group, Model No. P62-1010 pulls, or equal; or full length pulls as per individual itemized specifications and shown on Standard Detail FSD1-24. Catches to be heavy-duty magnetic type, except as otherwise indicated. Millwork cabinet hinged doors to be mounted with Blum 95º CLIP top thick door all metal hinges, nickel plated, with 3-dimensional adjustment, or equal, or as per individual itemized specifications.
3. Drawer Hardware: Slides to be 200 pounds (90 kilograms) minimum capacity per pair, 201 or 300 series stainless-steel, full extension, side-mounting, self-closing type, with stainless-steel ball-bearings, and positive stops; Component Hardware Group Series S52, or equal. Pulls to be Component Hardware Group, Model No. P62-1012, or equal; or full length pulls as per individual itemized specifications and shown on Standard Detail FSD1-24.
4. Sliding Door Hardware: Sliding doors to be mounted on large, quiet ball bearing rollers in 14-gauge (2 mm) stainless-steel overhead tracks and be removable without the use of tools. Bottom of cabinet to have stainless-steel guide-pins and not channel tracks for doors.
5. All hardware to be identified with manufacturer's name and number, so that broken or worn parts may be replaced.

B. Casters:
1. Type and size as recommended by caster manufacturer, NSF- approved for the type and weight of equipment supported; normally 5” (127 mm) diameter heavy-duty, ball-bearing, solid or disc wheel with non-marking grease proof rubber, neoprene or polyurethane tire unless otherwise specified. Minimum width

of tread to be 1-3/16” (30 mm). Minimum capacity per caster to be 250-pound (113.4kg), unless otherwise noted in itemized specifications.

2. Solid material wheels to be provided with stainless-steel rotating wheel guard.
3. Wheel and swivel bearings shall be sealed and show a polished plated finish per NSF.
4. Unless otherwise indicated, equip each item with two (2) swivel type casters and two (2) fixed casters, with foot brakes on two (2) casters.
5. Unless item is equipped with another form of all-around protective bumper, provide circular rotating bumper above each caster, 5” (127 mm) diameter tire of light grey synthetic rubber (hollow or closed-cell) on cadmium-plated disc.

C. Plumbing Fittings, Trim and Accessories:
1. General: Where exposed or semi-exposed, provide bright chrome plated brass or polished stainless-steel units. Provide copper or brass where not exposed.
2. Vacuum Breakers: Provide with foodservice equipment as listed in the itemized specifications.
3. Water Outlets: At sinks and at other locations where water is supplied (by manual, automatic or remote control), furnish commercial quality faucets, valves, dispensers or fill devices, of the type and size indicated, and as required to operate as indicated.
4. Waste Fittings: Except as otherwise indicated, furnish 2” (50 mm) remote-lever ball valve type waste valve, and 3-1/2” (89 mm) flat strainer.
5. Also refer to article 2.4.K for additional information.

D. Electrical Materials:
1. General: Provide standard materials, devices and components as recommended by the manufacturer or fabricator, selected, and installed in accordance with N.E.M.A. standards and recommendations; and as required for safe and efficient use and operation of the foodservice equipment, without sanitation concerns.
2. Components to bear the U.L. label or be approved by the prevailing authority.
3. Custom fabricated refrigerated/freezer units to be provided with vapor tight light receptacles, shatterproof lamps, and automatic switches. Wiring to be concealed.
4. Where light fixtures are specified or detailed as part of counters, cases, or fixtures; light fixtures with lamps to be furnished and installed. Warm white lamps to be provided, unless otherwise specified. If fluorescent light fixtures are specified, ballasts and tubes to be provided. Shields to be provided for all light fixtures.
5. Convenience and Power Receptacles: Make cutouts and install appropriate boxes or receptacles in fabricated fixtures, complete with wiring, conduit, receptacle, and stainless-steel cover plate. Receptacles and plugs to conform to N.E.M.A. standards. Electrical receptacles and devices to be first quality "Specification Grade". GFCI receptacles to be furnished as per the National Electrical Code.
6. Plugs and Cords: Where cords and plugs are provided, they are to comply with National Electrical Manufacturer's Association (N.E.M.A.) requirements. Indicate N.E.M.A. configuration for each applicable item.
7. Power Characteristics: Refer to Electrical Divisions specifications for project power characteristics. Also, refer to individual equipment requirements, for loads and ratings.
8. All electrical components (J-boxes, conduit, receptacles, switches, cover plates, light fixtures, panels, etc.) built into or on any equipment provided by Contractor, other than standard buy-out factory manufactured equipment, are to be vapor or

water-tight type. Provide buy-out equipment with vapor or water-tight electrical components wherever available.

2.4 FABRICATION OF METALWORK:

A. General Fabrication Requirements:

1. Remove burrs from sheared edges of metalwork, ease the corners and smooth to eliminate cutting hazard. Bend sheets of metal, at not less than the minimum radius required to avoid grain separation in the metal. Maintain flat, smooth surfaces, without damage to finish.
2. Reinforce metal at locations of hardware, anchorages, and accessory attachments wherever metal is less than 14-gauge (2 mm) or requires mortised application. Conceal reinforcements to the greatest extent possible. Weld in place, on concealed faces.
3. Exposed screws or bolt heads, rivets and butt joints made by riveting straps under seams and then filled with solder, will not be accepted. Where fasteners are permitted, provide Phillips-head, flat or oval head machine screws. Cap threads with acorn nuts and lock washers, unless fully concealed in inaccessible construction; and provide nuts and lock washers unless metal for tapping is at least 12-gauge (2.5 mm). Match fastener head finish with finish of metal fastened.
4. Where components of fabricated metal work are indicated to be galvanized and involve welding or machining of metal heavier than 16-gauge (1.6 mm), complete the fabrication and provide hot-dip galvanizing of each component, after fabrication, to the greatest extent possible (depending upon available dip-tank sizes). Comply with ASTM A123.
5. Welding and Soldering:
    a. Materials 18-gauge (1.3 mm), or heavier, to be welded.
    b. Seams and joints to be shop welded or soldered as the nature of the material may require.
    c. Welds to be ground smooth and polished to match original finish.
    d. Where galvanizing has been burned off, the weld is to be cleaned and touched up with high grade aluminum paint.
6. Provide removable panels for access to mechanical and electrical service connections, which are concealed behind or within foodservice equipment, but only where access is not possible and not indicated through other work.
7. Where ends of fixtures, splash backs, shelves, etc., are open, fill by forming the metal or welding sections, if necessary, to close entire opening flush to walls or adjoining fixtures.
8. Rolled edges are to be as detailed, with corners bullnosed, ground and polished.
9. Equipment to have 1/2” (12.7 mm) or larger radius coves in horizontal and vertical corners, and intersections, per NSF standards.

B. Metal and Gauges:

1. Except as otherwise indicated, fabricate exposed metalwork of stainless-steel; and fabricate the following components from the gauge of metal indicated, and other components from not less than 20-gauge (1 mm) metal:
    a. Table and counter tops:
        14-gauge (2 mm)
    b. Sinks and drainboards:
        14-gauge (2 mm)
    c. Shelves:
        16-gauge (1.6 mm)

d. Front drawer and door panels: 18-gauge (1.3 mm) (double pan type)
e. Single pan doors and drawer fronts: 16-gauge (1.6 mm)
f. Enclosed base cabinets:
18-gauge (1.3 mm)
g. Enclosed wall cabinets:
16-gauge (1.3 mm)
h. Exhaust hoods and ventilators: 18-gauge (1.3 mm)
i. Pan-type insets and trays:
16-gauge (1.6 mm)
j. Removable covers and panels: 18-gauge (1.3 mm)
k. Skirts and enclosure panels: 18-gauge (1.3 mm)
l. Closure/trim strips over 4" (102 mm) wide: 18-gauge (1.3 mm)
m. Hardware reinforcement:
12-gauge (2.5 mm)
n. Gusset plates:
10-gauge (3.4 mm)
o. Removable toe kicks:
14-gauge (3.4 mm)
p. Wall flashing
20-gauge (.95 mm)

C. Work-Surface Fabrication:
1. Fabricate metal work surfaces by forming and welding, to provide seamless construction using welding rods matching sheet metal, grinding and polishing. Where necessary for disassembly, provide waterproof gasketed draw-type joints with concealed bolting.
2. Reinforce work surfaces 30” (762 mm) on center both ways, with galvanized or stainless-steel concealed structural members. Reinforce edges, which are not self-reinforced, by formed edges.

D. Metal Top Construction:
1. Metal tops to be one-piece welded construction, including field joints. Secure to a full perimeter galvanized steel channel frame cross-braced not farther than 30" (762 mm) on center. Fasten top with stud bolts or tack welds. If hat sections are used in lieu of channels, close ends.
2. Properly designed draw fastening, trim strip, or commercial joint material to suit requirement is to be used, only if specified.

E. Structural Framing:
1. Except as otherwise indicated, provide framing of minimum 1” (25 mm) pipe-size round pipe or tube members, with mitered and welded joints and gusset plates, ground smooth. Provide 14-gauge (2 mm) stainless-steel tube for exposed framing, and galvanized steel pipe for concealed framing.
2. Where indicated, flange rear and end edges up to form splashes integrally with top, with vertical and horizontal corners coved of not less than 1/4” (6 mm) radius, die formed. Turn back splashes 1” (25 mm) to wall across top and ends with rounded edge on break, unless otherwise specified.

3. For die-crimped edges, use inverted "V" 1/2” (13 mm) deep inside and 2” (50 mm) deep on outside, unless otherwise shown. For straight down flanges, make 1-3/4” (45 mm) deep on outside. For bullnose edges, roll down 1-3/4” (45 mm).
4. Edges: die-formed, integral with top. For rounded corners, form to 1” (25 mm) radius, weld, and polish to original finish.

F. Field Joints: For any field joint required because of size of fixture; butt-joint, reinforce on underside with angles of same material, bolt together with non-corrosive bolts and nuts, field-weld, grind, and polish to a seam not visible to the naked eye.

G. Pipe Bases: Construct pipe bases of 1-5/8” (41 mm) diameter 18-gauge (1.3 mm) stainless-steel tubing. Fit legs with polished stainless-steel sanitary adjustable bullet feet to provide for not less than 2” (50 mm) of vertical adjustment without exposing threads. Space legs to provide ample support for tops, precluding any possibility of buckling or sagging and in no case more than 6’ -0" (1829 mm) centers.

H. Legs and Cross rails
1. Equipment legs and cross rails to be 1-5/8” (41 mm), 16-gauge (1.6 mm) stainless-steel tubing.
2. Welds at cross rails to be continuous and ground smooth. Tack welds will not be acceptable.
3. Bottom of legs to be hugged inward and fitted with a stainless-steel bullet-type foot with not less than 2” (50 mm) vertical adjustment without exposing threads.
4. Free standing legs or legs on island tables/counters with electrical/plumbing connections to be anchored to floor with bolt-down type flanged feet with stainless-steel fasteners.
5. Components:
   a. Steel Gusset: Stainless-steel exterior to fit 1-5/8” (41 mm) tubing, with Allen screw for fastening and adjustment. Not less than 3” (76 mm) diameter at top and 3-3/4” (95mm) long. Outer shell 16-gauge (1.6 mm) stainless-steel, reinforced with 12-gauge (2.5 mm) mild steel insert welded interior shell, or approved equal.
   b. Stainless-Steel Low Counter Legs: Stainless-steel exterior 5-3/4” (146 mm) minimum, 7” (178 mm) maximum length with stainless-steel 3-1/2” (89 mm) square plate with four countersunk holes, welded to top for fastening.
   c. Stainless-Steel Adjustable Foot: Stainless-steel 1-1/2” (37 mm) diameter tapered at bottom to 1” (25 mm) diameter, fitted with threaded cold rolled rod for minimum 1-1/2” (37 mm) diameter x 3/4” (19 mm) threaded bushing plug welded to legs, or approved equal. Push-in foot not acceptable.
6. Legs to be fastened to equipment with gussets, as follows:
   a. Sinks: Reinforced with bushings and set screw.
   b. Metal Top Tables and Dish Tables: Welded to galvanized steel channels, 14-gauge (2 mm) or heavier, anchored to top with screws through slotted holes.
   c. Wood Top Tables: Welded to stainless-steel channels, 14-gauge (2 mm) or heavier, anchored to top with screws through slotted holes.

I. Shelves:
1. Construct solid shelves under pipe base tables of 16-gauge (1.6 mm) stainless-steel, with 1-1/2” (37 mm) turned down and under edges on exposed sides, and 2” (50 mm) turn up against walls or equipment. Fully weld to pipe legs.

2. In fixtures with enclosed bases, turn up shelves on back and sides with 1/4" (6 mm) (minimum) radius and feather slightly to ensure a tight fit to enclosure panels.

J. Sinks:
1. Construct sinks of 14-gauge (2 mm) stainless-steel with No.4 finish inside and outside.
2. Form back, bottom and front of one piece, with ends and partitions welded into place. Partitions: double thickness, 2" (51 mm) minimum space between walls. Multiple compartments to be continuous on the exterior, without applied facing strips or panels.
3. Cove interior vertical and horizontal corners of each tub not less than 1/4" (6 mm) radius, die formed. Outer ends of drainboards to have roll rim risers not less than 3" (76 mm) high.
4. Drill faucet holes in splashes 2-1/2" (63.5 mm) below top edge. Verify center spacing with faucet specified. Grind and polish.
5. Sink insets to be deep drawn of 16-gauge (1.6 mm), or heavier, polished stainless-steel. Weld into sink drainboards with 1-1/2" (37 mm) x 1-1/2" (37 mm) x 14-gauge (2 mm) stainless-steel angle brackets; securely welded to sinks and galvanized cross angles spot welded to underside of drainboards to form an integral part of the installation.
6. The bottom of each compartment is to be creased such as to ensure complete drainage to waste opening. Slope bottom of sink bowls toward drain outlet.

K. Drains and Wastes and Faucets:
1. Furnish and install Fisher model 28940, or equal, ball valve type rotary drain assembly with flat strainer and connected overflow assembly, with chrome finish, in die-drawn inset type sinks and Bain Marie sinks.
2. Other custom fabricated sinks to be furnished with Fisher model 28932, or equal, ball valve-type rotary drain assembly, with flat strainer and chrome finish. Waste connection to have 2" (50 mm) external thread size, with 1-1/2" (37 mm) internal thread size.
3. Rotary Handle: Of sufficient length to extend to front edge of sink. No riveting, screws or soldering permitted to fit drains to sinks, with all parts of drains easily removable for servicing and replacement.
4. All faucets furnished with equipment included in this Section to be lead-free and comply with NSF Standard #61, Section #9; such as manufactured by Fisher, Chicago, or T&S.
5. Faucets and pre-rinse spray assemblies furnished with equipment included in this Section, are to have a maximum GPM flow rate in compliance with the Energy Policy Act of 2005 (EPAct) and later updates; or local requirements, whichever is lower. EPAct / local requirements are to be applicable to all faucets and pre-rinses; except for pre-rinse type assemblies used at glass icing / fill stations, fill hose / faucet assemblies at high water usage cooking equipment such as kettles, tilt fry pans, etc., and fill faucets at high volume / usage sinks, such as pot wash, mop sink and preparation sinks, etc. are to have flow rates of approximately 5 gpm flow minimum.
6. All flex hose type faucet assemblies, such as pre-rinses, kettle fill hoses, etc., to have an inline pressure type back-flow preventer in the hose assembly, as required by local codes.
7. All equipment provided by this Contractor, which discharges liquid waste exceeding 140º F (60º C), is to be provided with a cold-water drain tempering assembly per local codes.

L. Workmanship:
1. Best quality in the trade. Field-verify dimensions before fabricating; conform all items to dimensions of building; neatly fit around pipes, offsets and other obstructions.
2. Fabricate only in accordance with approved shop drawings, showing pipes, obstructions to be built around, and location of utilities and services.

M. Casework:
1. Enclosure: except as otherwise indicated, provide each unit of casework (base, wall, overhead and free-standing) with a complete-enclosure metal cabinet, including fronts, backs, tops, bottoms, and sides.
2. Bases to be made of 18-gauge (1.3 mm) stainless-steel sheets reinforced by forming the metal and the inclusion of hat-channels.
3. Ends, partitions and shelves to be stainless-steel.
4. Unexposed backs and structural members may be galvanized, unless otherwise noted.
5. Vertical ends and partitions to be single wall, with a 2” (50 mm) face.
6. Sides and through partitions are flush with bottom rail, welded at intersections.
7. Shelves: Provide adjustable standards for positioning and support of shelves in casework; except bottom shelf of cabinet mounted on legs or as specified. Turn back of shelf units up 2” (50 mm) and hem. Turn other edges down to form open channel. Reinforce shelf units and pilasters to support 40 pounds per square foot (195 kgs/sq meter) loading, plus 100 percent impact loading.
8. Bottom front rail of bases set on masonry platform to be continuously closed and sealed to platform.
9. Provide removable access hatchways to all concealed floor sinks under casework directly over floor sinks. Sink locations to conform to local Health Department code requirements.

N. Doors:
1. Metal doors to be double-cased stainless-steel. Outer pans to be 18-gauge (1.3 mm) stainless-steel with corners welded, ground smooth and polished. Inner pan to be 20-gauge (1 mm) stainless-steel fitted tightly into outer pan with a sound deadening material such as Celotex or Styrofoam used as a core. The two pans to be tack welded together and joints solder filled. Doors to finish approximately 3/4” (19 mm) thick and be fitted with flush recessed type stainless-steel door pulls; or full-length continuous pulls as per individual itemized specifications and shown on applicable Standard Detail sheet.
2. Wood doors to be fabricated as detailed.
3. Hinged doors to be mounted on heavy-duty NSF-approved hinges, or as noted on plans or specifications.

O. Drawer Assemblies:
1. Assemblies to consist of removable drawer body mounted in a ball bearing slide assembly with fully enclosed housing.
2. Slide assembly consists of one pair of 200-pound (90 kilograms) capacity stainless-steel roller bearing full extension slides, with side and back enclosure panels, front spacer angle, two drawer carrier angles, secured to slides and stainless-steel front.
3. Drawers intended for tools and general non-food products storage are to have 20” x 20” x 6” deep (508 mm x 508 mm x 152 mm), 18-gauge (1.3 mm) minimum stainless-steel drawer pans.

4. Drawers intended to hold food products are to have 12” x 20” x 6” deep (305 mm x 508 mm x 152 mm) stainless-steel food pans.
5. All drawer pans to be easily removable without tools or disassembly of any drawer assembly components.
6. Drawer fronts are double-cased, 3/4” (19 mm) thick, with 18-gauge (1.3 mm) stainless-steel welded and polished front pan. Steel back pan shall be tightly fitted, and tack welded. Sound-deaden with rigid insulation material.
7. Provide drawers with replaceable soft neoprene bumpers or for refrigerated drawers - a full perimeter replaceable refrigerator gasket.

P. Closed Base: Where casework is indicated to be located on a raised-floor base, prepare casework for support without legs, and for anchorage and sealant application, as required for a completely enclosed and concealed base.

Q. Support from Floor: Equip floor supported mobile units with casters, and equip items indicated as roll-out units, with manufacturer's standard one-directional rollers. Otherwise, and except for closed-base units, provide pipe or tube legs, with adjustable bullet-design feet for floor supported items of fabricated metalwork. Provide 2” (50 mm) vertical adjustment of feet (concealed threading).

R. Shop Painting:
1. Clean and prepare metal surfaces to be painted; remove rust and dirt. Apply treatment to zinc coated surfaces, which have not been mill phosphatized. Coat welded and abraded areas of zinc coated surfaces, with galvanize repair paint.
2. Apply 1.5 mil (dry film thickness) metal primer coating, followed by 2, 1.0 mil (dry film thickness) metal enamel finish coatings.
3. Bake primer and finish coatings in accordance with paint manufacturer's instructions for a baked enamel finish.

S. Sound Deadening:
1. Sound-deaden underside of metal tops, drainboards, undershelves, cabinet interior shelves, etc., above the underbracing/reinforcing/framing only.

2.5 ACHITECTURAL MILLWORK EQUIPMENT:

A. The following general requirements shall govern the construction of millwork-built fixtures, except where otherwise noted. Work shall be performed by skilled mechanics of the trade and shall be of the highest quality throughout, in such a manner as to fulfill the intent of the Contract Documents. Perform architectural woodwork in accordance with “Architectural Woodwork Quality Standards” published by the Architectural Woodwork Institute (AWI). Fabricator shall have a demonstrated ability in fabricating woodwork items similar in type and quality to those required for this project.
1. All fixtures shall be made by one manufacturer and assembled in single and complete units as the dimensions will permit shipment to and installation of at the building. Large pieces requiring sectional construction shall have their parts accurately fitted and aligned with all others, and provided with ample screws, glue and bolt blocks, tongues, grooves and splines, dowels, mortises and tenons, screws bolts or suitable means of concealed fastening, as required to render the work substantial, rigid and permanently secured in proper position to each related section.

2. Sufficient additional material shall be allowed to permit accurate scribing to walls, floor and related work, and due allowance made whenever possible for such shrinkage as may develop after installation. Single and sectional units shall be provided with adequate cleating, blocking, crating and other forms of protection as required precluding damage during shipping and handling.
3. Framing and blocking members shall be assembled with bolted and screwed connections and should be secured to the structural backing with cinch, expansion screws or toggle bolts, as required; spaced and installed to insure ample strength and rigidity. Rails and stiles shall be mortised and tenoned, work neatly mitered and membered, all butt joints made flush and smooth, and all permanent joints made up with water resistant glue. All fixtures shall be assembled without face screws or nails, except where it may be necessary to attach items. All face screws or nails which are necessary shall be counter sunk and plastic wood or wood plugs used to cover head, and the plug neatly touched up. The heads of all screws used in any assembly shall be counter sunk below the surface.
4. The core material shall be marine-grade, 7 ply-substrate or MEDEX exterior resin medium density fiberboard substrate; conform to ANSI A208.2.3.3.4. All substrate materials shall be LEED certified and meet the LEED requirements for the project.
5. Back sheet shall be NEMA LD .020” (0.5 mm) thick, Type V, Grade 91 plastic laminate; apply on all surfaces not covered with plastic laminate; coordinate color with exposed surface color; comply with NSF Standard 35.

B. Construction / Joints:
1. Follow AWI Premium Grade Standards; factory assembled parts and prefinished; flush type fronts and overlapping ends; ¾” (19 mm) core material base cabinet, end and dividers with corner joints between framed members fully lock-jointed, glued and screwed; dado and glue cabinet backs into sides and bottom; scribe countertop and backsplashes; secure countertops to base cabinet from underside; fully cure surfaces prior to installation. Mortise and tenon, spline, dowel and/or pin lock and glue work to avoid use of nails wherever practical. Make butt joints with an approved device for prevention of separation of members. Blind nail and conceal.

C. Plastic Laminate:
1. Plastic laminate shall be bonded to all exposed surfaces with Urac 185 adhesive or equal, to minimum ¾” (19 mm) fir-faced, close grain marine-grade plywood applied under high pressure. In accordance with AWI 1600A-G-1, use horizontal grade on all exposed surfaces, vertical grad on semi- exposed surfaces and sealed paint on all concealed surfaces. Reject plastic laminate or plastic backing shall be used to prevent warping, unless otherwise specified. All edges shall be carefully sanded to smooth finish, removing burns, nicks, and cur marks. Plastic laminate joints shall be finished without wavy and unsightly joints. Joints need not be mitered except as specified. Hand sand edges to a slight chamfer.
2. Top sheet shall be placed on and over finished edge. Ease exposed edge to overlap sheet. Use largest sheet possible in order- to minimize seams.
3. Coved backsplashes shall be a minimum of ¼” (6 mm). End splashes may have a square intersection with tabletops unless specified otherwise.
4. Plastic laminated shelves shall be laminated with horizontal grade laminate on the side and vertical grade at all edges.

D. Doors, Hinged:
1. Hinged doors shall be fabricated of ¾" (19 mm) thick marine-grade plywood with hardwood full perimeter edge with plastic laminate on face and self-edging on exposed sides unless indicated otherwise in drawings and details. Door hinges, pulls and catches shall be supplied and detailed. Provide Grass 1200, 176 degree opening concealed casework hinges or equal by Blum or Amerock. Door catches shall be Component Hardware Model M22-2420 for non-magnetic and Model M30-2400, heavy duty, self- aligning for magnetic.
2. Utilize EPCO Model MC 4023.5 or as specified in the Item Specifications.
3. Door locks shall be Component Hardware Model P30 Series; stainless-steel faced; master keyed as specified.

E. Doors, Sliding:
1. Sliding doors shall be fabricated of solid core marine-grade plywood with hardwood edges and constructed similar- to hinged doors. Doors shall be mounted on E-Z Glides track. Doors shall be removable without the use of tools. Rubber stops shall be provided concealed in end stile or mullion.

F. Access Panels: Access panels shall be fabricated of ¾" (19 mm) nominal thick hardwood and shall be fabricated as a door. Each access panel shall be provided with 2 (two) magnetic catches at top and 2 (two) 3/16" (5 mm) positioning pins at bottom.

G. Drawers:
1. Drawers shall have dovetail construction, well glued and blocked. Fronts shall be not less than ¾" (19 mm) thick hardwood. Sides and back shall be ½" (13 mm) thick fabricated of Birch, Maple, or Sycamore except where extension slides are used, in which the side shall be ⅝" (10 mm) thick. Bottom shall be milled into fronts and sides.
2. Drawers shall be provided with suitable stops. Provide pulls as detailed or specified. The inside surfaces of all drawers shall receive one coat of penetrating primer and one coat of glass lacquer.

H. Painted Finishes:
1. Painted finishes shall have exposed surfaces free from defects and blemishes that would show after being finished, regardless of grade specified. All surfaces specified to receive paint or enamel finish shall receive one cross coat of lacquer type undercoat. The undercoat shall be of appreciably different color from that of the finish coat, and of proper ground color with relation to the finish coat. After the undercoat has been thoroughly dried, surfaces shall be sanded smooth, and two coats of enamel shall be applied. Back painting shall be provided for all cabinet and woodwork prior to installation.

I. Interior & Wall Shelves:
1. Interior shelves shall be adjustable with flush routed-in shelf standards. Wall shelves to be fabricated as specified and as per "Standard Detail".

J. Fire Retarding:
   1. Where required by code, all required materials are to be treated with fire retardant chemicals to achieve the required flame spreading performance rating. Retardant chemicals must be a type approved by local authorities.

2.6 FILTER EXHAUST HOODS AND/OR WATER WASH VENTILATOR FABRICATION:

A. 18-gauge (1.3 mm) type 201 or 304 stainless-steel external welded construction, in accordance with the latest edition of N.F.P.A. No.96 and International Mechanical Code, including all applicable appendices. Exposed welds to be ground and polished. Exhaust hoods to be U.L. Listed as available for length specified.

B. Furnish type of fixture specified. Fixtures to be U.L. listed for cooking equipment exhaust hoods, NSF-approved, and with sealed safety lenses.

C. Furnish welded stainless-steel formed duct collars at ceiling or wall duct connections. Verify size and location of duct connections required in this contract before fabrication.

D. Pre-piped liquid chemical or water fire suppressant system, as specified; complying with applicable local and N.F.P.A. regulations. Wet chemical fire suppression systems to comply with UL 300 Standards. Water fire suppression systems to comply with U.L. Category Subject 199E. Each pull station is to be clearly identified with a permanent-type label, as to which exhaust hood(s) it is for. Each exhaust hood is to have a matching permanent-type label, identifying which pull station activates its fire system.

E. All cooking equipment below exhaust hoods/ventilators, on casters, are to be provided with positive wheel placement systems for the rear casters, similar-to Posi-Set units, in compliance with NFPA-17A 5.6.4 and NFPA-96 12.1.2.3.

F. Water wash or ultra-violet control panel to be by the same manufacturer as the ventilator, with time clock control for automatic operation. Provide stainless-steel trim strips for recessed control cabinet applications. Provide stainless-steel chase for surface mounted control panel, from top of panel to ceiling, full width and depth of panel.

2.7 REFRIGERATION EQUIPMENT:

A. General:
   1. Furnish either single or multiple compressor units, as specified or recommended by the manufacturer for the sizes and variations between connected evaporator loads as indicated.
   2. Furnish units of the capacities indicated, arranged to respond to multiple- evaporator thermostats and defrosting timers. Include coils, receivers, compressors, motors, and motor starters, mounting bases, vibration isolation units, fans, dryers, valves, piping, insulation, gauges, winter control equipment and complete automatic control system.
   3. Refrigerant: Pre-charge units with type or types recommended by manufacturer for services indicated, with quick-disconnect type connections only where specified, ready to receive refrigerant piping runs to evaporators and (where remote) to condensers. All refrigerant and associated components to comply with the requirements of the Montreal Protocol Agreement. No CFC or HCFC refrigerants or associated components will be permitted on this Project. HFC refrigerants and components are to be used. Contractor is responsible for coordinating these requirements with manufacturers.

4. Foodservice equipment items included in this Section, with remote refrigerated systems, are to include interconnecting refrigeration lines, sizing, and insulation between components, as per manufacturer's installation instructions, and as determined by this Contractor's Certified Refrigeration Sub-Contractor; and only after a thorough examination of actual site conditions and obstacles which might affect the routing. Routing should be as direct and short as possible and practical. Refer to additional requirements listed in this Section 11 40 00, 1.5 Laws, Ordinances and Standards.
5. The minimum outdoor operating ambient temperature for design of units is -10 degrees Fahrenheit (-23 Centigrade), or lower as applicable for extreme low local conditions. The maximum indoor design temperature for operation of compressor units is 95 degrees Fahrenheit (35 Centigrade). The maximum outdoor ambient design temperature is to be determined by Contractor with prevailing conditions at mounting location of compressor, such as sun exposure, limited ventilation, high fences/walls, roof color and materials, local climatic extremes, etc.; but in no case is it to be less than 100 degrees Fahrenheit (37.8 Centigrade).
6. All refrigeration systems with remote condensing units and jobsite installed interconnecting refrigeration lines shall be tested to verify that there are no leaks. Leak testing shall be equal to or better than a professionally recognized 48-hour minimum, pressure holding test. If any leaks are detected, they shall be repaired, and another leak test preformed; until there are zero leaks detected. A written report of the type test preformed, and a step-by-step record of the procedure and readings shall be submitted to Contractor for inclusion in the Operations and Maintenance Data Manuals.

B. Components:
1. Coils for fabricated refrigerators to have vinyl plastic coatings, stainless-steel housings; and be installed in such a manner as to be replaceable.
2. Provide guards for all refrigeration/freezer fans, with maximum 1/2" (13 mm) mesh.
3. Remote refrigeration system to be complete with thermostatic expansion valves at the evaporator.
4. Fabricated refrigerated compartments to be fitted with flush dial thermometers, with chrome plated bezels. Thermometers to be adjustable and shall be calibrated after installation. Thermometers to have an accuracy of ± 2 degrees Fahrenheit (1 degree Centigrade).
5. Hardware:
   a. Refrigerator hardware for fabricated refrigerator compartments to be heavy-duty components.
   b. Self-closing hinges.
   c. Latches to be magnetic edge mount type, unless specified or detailed otherwise.
6. Doors and drawers for walk-in coolers/freezers, and reach-in refrigerated compartments, both fabricated and standard, to be fitted with cylinder locking type latches, and provided with master keys.
7. Provide and install shut-off valves and service port for each compressor, manifold or header, and refrigerated fixture for multiplex and parallel installations to enable service personnel to service one (1) fixture while other fixture(s) connected to the same compressor can continue to operate. Isolation valves for individual fixtures based upon the sizes of the individual pieces.
8. Drawers for refrigerated fabricated compartments shall be complete with heated surround at closing perimeter.

C. Cold Pans: Ice pans, refrigerated pans and cabinets to be provided with breaker strips, where adjoining top or cabinet face materials, to prevent transfer of cold.

D. All mechanically cooled custom fabricated or standard buy-out refrigerators with openings in the top for cooling pans, and/or all built-in or drop-in mechanically cooled cold pans are to comply with and be listed by NSF Standard #7. Contractor is to verify that the specified unit complies with this requirement.

E. Ventilation of Refrigerated Equipment:
1. Adequate ventilation to be provided for custom fabricated equipment with integral refrigeration condensing units, both built-in and drop-in. If flow-through ventilation cannot be provided, provide flow direction partitions and an additional squirrel fan(s) capable of cooling the condensing unit.
2. If, in the opinion of the Contractor, additional room ventilation is required to ensure correct operating temperatures of standard buy-out, custom fabricated, or remote refrigeration condensing units, or compressor rack assemblies, they are to so state in a letter to the Architect, for evaluation and decision.

2.8 REMOTE REFRIGERATION SYSTEMS

A. All remote refrigeration systems shall be furnished and installed by one contractor, unless otherwise specified. Provide all components necessary for a complete and operable system. System to be fully capable of satisfying the refrigeration requirements for each fixture as defined by the manufacturer of each fixture.

B. Compressor and Condensing Units:
1. Units shall be factory assembles complete with hermetic units below 1 HP, semi-hermetic units 1 HP and larger, air or water-cooled condenser, depending upon building conditions and specifications, high-low pressure controls, suction accumulator on low temperature system, sight glass, liquid line dryer, suction and discharge service valves, liquid receiver, and electric control panel. The electrical control panel shall be furnished with magnetic motor starter, defrost timer clock, and contractors in accordance with "Refrigeration Schedule". Compressor capacities shall be based on Air Conditioning and Refrigeration Institute (A.R.I) Standards. The refrigerant for medium and low temperature fixtures to be CFC free and conform to the Montreal Protocol Agreement.
2. Capacities shall be based on the following:
   a. Compartment temperature and evaporating temperature greater than 32°F (0°C) 18 to 20 hours operations.
   b. Compartment temperature greater than 32°F (0°C) and evaporating temperature less than 32°F (0°C) 16 hours operation.
   c. Compartment temperature and evaporating temperature less than 32°F (0°C) 18 hours operation.
3. Condensing units shall be mounted on a steel base to affect a quite operation. All rotating parts to be carefully balanced for minimum vibration and lubricated with forced or splash oil system. Receiver shall be sized for a complete pump down of the system and shall be shell type with fusible plug.
4. Compressor units to be provided with suction and discharge back setting type service valves and standard machinery finish.

5. Motors shall be single speed, maximum 1750 R.P.M. compound wound ball bearings or sleeve bearing. Double squirrel cage motors with high starting torque set and low starting current to be used in a 3-phase application.
6. All machines to be equipped with quick acting type high-low pressure control switches having adjustable range and differential and high-pressure cut-out. Cut-out to be automatic reset type.
7. For air-cooled units, the condenser shall be a standard manufactured part of the equipment. Condensing temperatures shall be based upon (100°F 38°C) ambient air.
8. Other components and accessories, such as suction filter and crank case heater shall be furnished when specified in the itemized specifications.

C. Motor Starters-Contactors:
1. All single- phase motors shall be provided with mounted and internally wired contactors, except where pre-wired units are furnished without contactors. Single phase compressors shall be provided with built-in thermal and electrical overload protection.
2. All three-phase motors shall be provided with magnetic type starters with quick trip overload elements matched for motor amperage except where overload protection is built into the compressor motor and the manufacturer supplies a contactor instead of a starter. Overload heater element shall be sized according to manufacturer's recommendations. Compressor motor starters shall be definite purpose starters with manual reset.
3. Starters shall be installed upon surfaces free from excessive vibrations.
4. Where starters are required for installation in a motor control center, make and model of control center shall be verified, and starters provided to match.

D. Oil Separator
1. Provide oil separators, except when Compressor Manufacturer requires otherwise, 34°F, (1^{O}C) and below and install as near as possible to the compressor. The return line shall be connected to the top of the crankcase above the oil level. Where compressor does not have connection for oil return line from separator, connect to a tee in the suction line adjacent to the compressor. Exposed oil return line to be provided with shut-off valve of the packless stem type.

E. Compressor Rack Systems:
1. Racks shall be of the number of tiers and quantity to accommodate the number of condensing units specified for each rack assembly and allow for service clearance and ventilation. Review and confirm access into building or housing requirements to roof top locations.
2. Racks shall be fabricated with structural steel of size and quantity to properly support the equipment to be installed on the rack. In special applications where building access is limited, construct rack framing with Dexion of Unistrut material.
3. Racks shall be all welded construction with welds ground smooth.
4. After completion of fabrication the complete rack shall be cleaned, primed and painted with top quality oil-base enamel.
5. Each rack shall be equipped with a pre-wired receptacle.

6. Racks shall be pre-wired to a circuit breaker panel and pre-plumbed to a header (when specified water cooled) requiring a single point electrical and plumbing connection.
7. Racks shall have UL or equivalent approval.
8. Special Conditions: For custom built racks for individual condensing units provide Dixon Angle Iron.

F. Coils and Cooling Units:
1. Units shall be direct expansion type of size and design to effect required temperature, humidity and to suit application intent.
2. Units shall be hung from the ceiling with 1/2" (13 mm) nylon rods with plated steel nuts and lock washers. Rods shall extend through ceiling to bracing adequate for the suspended weight. Bracing shall be furnished as required; penetrations shall be sealed and trimmed with escutcheon plates.
3. Units shall be installed tight to ceiling. All installations adjacent to walls shall be set out a minimum distance conforming to manufacturer's directions, to ensure proper air circulation and performance.
4. Units with fan or blower and motor shall have thermal overload protection and be wired as indicated in "Refrigeration Schedule".
5. Defrost cycle shall be based on the following:
   a. Coils for 32°F (0°C) and lower shall have an electric defrost controlled by a time clock mounted on the compressor rack or at evaporators locations inter-wired by Division 26 - Electrical.
   b. Coils for 33° (0.6^{o}C) and 34°F (1°C) shall have an air defrost controlled by a time clock mounted on the compressor rack or at evaporators locations inter-wired by Division 26 - Electrical.
   c. Coils for temperature above 34°F (1°C) shall have an air defrost in the off cycle controlled by proper sizing of the coil and the compressor.
6. Location of coils shall be coordinated with shelving and floor sink locations.
7. All coils for fabricated refrigerators and/or freezers shall be installed for accessibility and replacement.

G. Penetration Sleeves and Plates:
1. Service line penetrations of insulation to accommodate electrical conduit, refrigerant and drain lines shall be limited to a minimum with service stubbed through insulation or locations predetermined by respective divisions.
2. Where service lines penetrate insulated walls, the opening shall be packed with caulking, before trimming with escutcheon plate.
3. Where service lines penetrate building walls outside of foodservice areas, the opening shall be packed with “Perma-Gum” and foam caulking.
4. All exposed ends of sleeves, both inside and outside of compartments, are to be trimmed with 24- gauge stainless- steel escutcheon plates, furnished as blanks in which respective work divisions shall cut required line holes and install.

H. Refrigerant Piping:
1. Copper tubing for refrigerant piping shall conform to ASTM standard specifications, serial designation B-88. All piping shall be type "L" ACR hard copper or cleaned and sealed soft type "L" tubing, dry seal or equal as indicated. Forged or wrought copper fitting with sweat or soldered joints shall

be used.

2. Tubing shall be cut only with a tube cutter and sized with a sizing tool.
3. Piping shall be exposed to view as required by the standard safety code for mechanical refrigeration.
4. The liquid suction lines form condensing units to coil shall be sized and run as shown on the “Refrigeration Schedule” and Refrigeration Drawings.
5. Piping run within cold storage rooms shall be finished with aluminum paint.
6. For exposed areas, accessible furred ceiling spaces and in walls or excavated trench type installations, hard copper tubing shall be used. Exposed tubing shall be run in a manner to preclude damage by activities in the area; or shall be protected by conduit, furnished and installed as part of this contract. Conduit shall have water evacuated and both ends completely sealed.
7. For piping run in conduit through inaccessible areas, such as under slab on grade, continuous one-piece soft copper tubing shall be used with no joints. In lieu of large piping in conduit, especially vertical runs, random lines may be used; carefully fabricated and assembled to ensure equal pressure drop.
8. Ends of lines shall be capped to prevent contamination and opened only at time of final connection.
9. Suction lines shall be sized for a maximum pressure drop from evaporator to compressor 2 lbs. (0.9 kg.) for high and medium temperature systems, and of 1 lb. (0.45 kg.) for low temperature systems and shall allow gas velocities of not less than 750 FPM (3.8 M/sec.) in horizontal runs and 1500 FPM (97.6 M/sec.) in vertical risers. Liquid lines shall be sized for a maximum pressure drop of 3 lbs. (1.36 kg.) from receiver to evaporator.
10. Tubing runs shall be graded or pitched to prevent trapping of oil. Suction lines shall pitch 1/2"/10"-0" (13 mm/2.54 m) minimum.

I. Joints and Connections:

1. Fittings shall be long radius wrought copper only as manufactured by Mueller Brass Company or equal.
2. Vertically run suction lines shall have one piece of manufactured oil "P" traps. Line to be sized for proper velocity for oil return to compressor(s).
3. 1/8" NPT by 1/4 fl. half union for all suction and discharge service valves with 1/4 fl. cap.
4. Reduction in piping size shall be made with a manufactured reducer coupling.
5. Flare nuts shall be short forged or frost-proof.
6. All surfaces to be joined must be prepared and cleaned. When soldering stop or solenoid valves, wrap valves with moist fabric to absorb excessive heat. Stop valves shall be partly open. When soldering expansion valves or pressure regulating valves, remove power assembly, if necessary, to prevent damage by excessive heat.
7. Copper joints shall be made with Handy & Harmon "Sil-Fos" brazing alloy, "Phoson 15", "Silvaloy 15" or equal; melting point of 1185-1350°F; (640°C. - 732°C.) Silver content not less than 15%.
8. Copper to brass joints shall be made with Handy & Harmon "Easy Flo 45" brazing alloy "Silvaloy 45", "Mueller 122" or equal; melting point of 1125-1145°F, (607°-618°C.) silver content not less than 45%.

J. Hangers and Supports:

1. For all piping not run within conduit, provide adjustable hangers, anchors or

straps as required. Hanger spacing shall not exceed 8'-0".

2. Insulated copper piping shall be provided with approved type sleeves at hanger points.
3. All insulated copper piping shall be isolated from supports by means of felt wrapping or with "Trisolater" by Semco or approved equal.
4. Vertical piping shall be supported at intervals with spring type hangers or a substantial pipe at case of the pipe. All horizontal pipe runs connected to vertical risers must be adequately supported.
5. For suspended conduit, support shall be by means of hanger permitting screw adjustments. Sufficient hangers shall be used to provide support, allow expansion, and limit vibration.

K. Piping Sleeves:

1. Coordinate sleeves provided by the General Contractor through walls which allow for fully insulated lines. Extend sleeves entirely through wall and dress each end with a chromium plated wall plate neatly fitted against the wall, securely fastened and sealed in place. All sleeves through wall shall be of standard weight steel pipe.
2. Piping lines and sleeves at wall or floor penetrations shall be caulked and made vermin-proof at all locations.

L. Piping Insulation:

1. Suction lines run in conduit shall be insulated according to ambient and humidity conditions to prevent condensation and freezing.
2. Refrigeration suction lines outside of refrigerated compartments, not run in conduit, shall be insulated back to compressors with Armstrong Armaflex AP foamed plastic insulation or as determined by code. Thickness of material shall suit service, ambient and humidity conditions, to prevent condensation, minimum thickness 1/2" (15 mm.).
3. Freezer Storage Room drain lines should not be extended through adjacent cooler compartments if at-all possible. All such lines shall be insulated with 1/2" (15 mm) minimum thickness of Armstrong Armaflex AP foamed plastic insulation to prevent condensation. Carefully seal end of insulation tight against freezer wall surface.
4. Piping for cooling water services or refrigerant piping exposed to freezing ambient temperatures shall be insulated with 1/2" (15 mm) minimum thickness of Armstrong Armaflex AP foamed plastic insulation. Paint exterior installation with Armaflex paint.
5. Thickness of material shall suit service, ambient and humidity conditions to prevent condensation.
6. Joints shall be sealed with Armstrong 520 adhesive. Insulation shall be continuous through clamps. Provide additional insulation where suction lines must be run within 12" (304 mm) or less of water or underground waste lines.
7. Exterior-run piping shall be insulated as per above and covered with stainless-steel channels secured to structure, sealed to be weather-proof.

M. Heat Interchangers:

All blower controls, unit coolers, plate type evaporators and other evaporators where specified, are to be provided with heat interchangers, with a capacity to match the condensing unit.

N. Temperature Control:
1. Temperature control of cold storage rooms shall be by line voltage thermostats operating liquid line solenoids.
2. Temperature control for remote normal temperature refrigerator shall be by low pressure switch setting.
3. Temperature in each cold storage room compartment shall be controlled by electric thermostat, Ranco No. 010-1408, located within compartment and sensing element positioned to avoid fan discharge air stream.
4. Contractor to coordinate any additional specified temperature control/monitoring/alarm system within this document set including assisting with coordination of home-run control wiring, wireless assembly coordination and HACCP requirements in terms of reporting.

O. Valves and Accessories:
1. All valves and controls shall be standard weight and suitable for service purpose intended, and subject to approval by the Designer.
2. Provide shut-off valves and service port for each refrigerated fixture for multiplex installations to enable service personnel to service one (1) fixture while other fixture(s) connected to the same compressor can continue to operate.
3. Each system shall include condensing unit with standard valving, refrigerant piping, refrigerant, evaporator(s), liquid and suction line isolation valves within 5'-0" (1500 mm) of evaporators, thermostatic expansion valve for evaporator, heat exchanger, filter-dryer, liquid line solenoids for Cold Storage Rooms and liquid indicator.
4. Vibration eliminators on compressor suction and discharge lines, size same as piping, as manufactured by Anaconda.
5. Refrigerant shut-off valves shall be as manufactured by Henry or Superior Valve Company. Valves shall be placed and in liquid line for each condensing unit and in each liquid line to each evaporator.
6. Expansion valves shall be Sporlan, or approved equal, furnished and installed in the liquid line at the evaporator, unless provided with manufactured equipment. External equalizer expansion valves shall be provided for coils fitted with refrigerant distributor.
7. A Sporlan, or approved equal, drier shall be provided at the compressor. Up to 3HP shall be a Catch-All series; larger than 3HP shall be angle replaceable cartridge series or approved equal.
8. Each liquid line sight glass shall be Sporlan "See All" moisture and liquid indicator and shall be full line size or approved equal.
9. Solenoid valves shall be Sporlan, or approved equal, line voltage, manual lift stem type, to operate at maximum of 2 lbs. (0.9kg.) pressure drop across the valve. Valves shall be full line size, using silver solder connection as applicable. A liquid line solenoid, normally closed, shall be used with temperature controller for each Cold Storage Room compartment coil on a system.
10. Include a suction line filter with access valve adjacent to compressor. Filter shall be a Superior "F" Series or equal.
11. EPR, CTR, and/or CDA valves shall be Alco, or Sporlan, or approved equal.
12. Suction accumulators shall be Refrigeration Research 3700 series or Virginia VA series, or approved equal.

13. Discharge line mufflers shall be Refrigeration Research M-10 and M-15 or AC and RSS- 6300 series or approved equal.
14. Time clocks shall be Paragon or approved equal.

P. Drain Lines:
1. Type "L" copper coil drain lines extended to exterior of refrigerated compartments over floor sinks (drain) with "S" traps at termination ends.
2. Provide clean out "T" and cap at each change of direction in the lines. Provide individual drain lines for each coil unless otherwise specified. Drain lines shall be run tight to refrigeration compartment walls with minimum pitch of 2" per foot.
3. Drain lines inside low temperature compartments shall be equipped with drain-line heaters provided by and wired by electrical division. Freezer Storage Room drain lines should not be extended through adjacent cooler compartments if at all-possible. (Drain line in low temp compartment to be insulated with Armaflex ½" (13 mm) – insulation and wall fastening by the foodservice equipment contractor).
4. Drain lines on the exterior of refrigerated compartment shall be painted with chrome tone paint and shall be trapped to disallow ambient air infiltration into refrigerated cavity.

Q. Refrigerant/Compressor Oil Reclaim:
1. For existing refrigeration systems which may be reused, abandoned or where site conditions warrant, the system(s) refrigerant, oil and/or other components shall be reclaimed and contained by certified personnel in conformance to Refrigerants and Hazardous Waste criterion as specified by the Environmental Protection Agency and/or Montreal Protocol Guidelines & Requirements.

2.9 MISCELLANEOUS MATERIALS AND FABRICATION:

A. Nameplates: Whenever possible, locate nameplates and labels on manufactured items, in accessible position, but not within customer's normal view. Do not apply name plates or labels on custom fabricated work, except as required for compliance with governing regulations, insurance requirements, or operator performance.

B. Manufactured Equipment Items: Furnish items as scheduled or herein specified. Verify dimensions, spaces, rough-in and service requirements, and electrical characteristics, before ordering. Provide trim, accessories and miscellaneous items for complete installation.

C. Insert Pans:
1. General: Cut-outs, openings, drawers, or equipment specified or detailed to hold stainless-steel insert pans to be provided with a full complement of pans as follows:
   a. One (1) stainless-steel, 20-gauge (1 mm) minimum, solid insert pan – in us pan size or gastronorm configuration as specified for each space, sized per plans, details, or specifications.
   b. Where pan sizes are not indicated in plans, details, or specifications, provide one full-size pan for each opening.
   c. Provide maximum depth pan to suit application and space.

2. Provide 18-gauge (1.3 mm) NSF- approved removable stainless-steel adapter bars where applicable.
3. All cut-outs and openings, or equipment specified or detailed to hold stainless-steel insert pans, shall be provided with a hinged stainless-steel removable night cover.

D. Tray Slides: Before fabrication of counters with tray slides, verify:
1. Size and shape of tray with Owner/Operator prior to fabrication. Edge of tray should not overhang outer support/slider by more than 2" (50 mm). If edge of tray exceeds this dimension, notify Architect, in writing, for evaluation and adjustment, if necessary.
2. Configuration of corners, turns, and shape of tray slides for proper support and safe guidance of trays.
3. Tray slide to be capable of supporting 200 pounds per linear foot (298 kgs/meter), live load.

E. Self-leveling dispensers: Verify type, make dimensions and weight of ware with Owner/Operator; and submit to the dispenser manufacturer, for proper sizing and calibration of dispensers.

F. Carbon dioxide (CO^2) equipment: Where equipment requires connection with compressed CO^2 cylinder for operation, provide 2-cylinder manifold and control system (integral with equipment) with proper connectors for Department of Transportation (DOT) approved type cylinders, complete with cylinder safety devices and supports. Applicable to projects with CO2 equipment included in Contractor's specified equipment.

G. Reasonable quietness of operation of equipment is a requirement, and Contractor will be required to replace or repair any equipment producing out-of-the-ordinary intolerable noise. This also includes providing and installing bumpers and gaskets for doors and drawers on fabricated and standard manufactured items and sound insulation where feasible.

H. Gas pressure regulator: All gas fired equipment included with this Section is to be provided with a gas pressure regulating valve with a built-in vent limiting device sized per WC pressure rating of this project. Contractor is responsible for coordinating this requirement with their manufacturers and suppliers.

PART 3 – EXECUTION

3.1 SUPERVISION:

A. A competent supervisor, representing the Contractor, is to be present at-all times during progress of the Contractor's work.

B. Contractor is responsible for coordinating with all applicable Design Team members, Key Ownership Stakeholders Assigned, General Contractor, other Contractors and/or Sub-Contractors and Trades involved in this Project and associated with any items or work provided under this Section; as required for the successful provision, installation, completion, and functioning of these items and/or work, and the Project in general. This is to include, but not be limited to, exchange of shop drawings, details, and manufacturer's information, supplying templates or actual components to be installed in or on items provided by other Sections, for coordination; and coordinating with and between their

own internal staff, sub-contractors, trades, manufacturers, fabricators and installers, for compliance with the Contract Documents.

C. Contractor responsible for obtaining any documents referenced in this Section and on any associated drawings, which contain information relative to the performance of this Contract; and disseminating and coordinating the pertinent information contained in them, with the appropriate sub-contractors, manufacturers, fabricators, and/or installers.

D. Contractor is to take every precaution against injuries to persons or damage to property.

E. Contractor is to store his apparatus, materials, supplies and equipment in an orderly fashion at the site of the work so it will not unduly interfere with the progress of his work or the work of any other contractors.

3.2 SITE EXAMINATION:

A. Verify site conditions under the provisions of the General Conditions, Supplementary Conditions, and applicable provisions of Division 1 Sections. Notify the Architect, in writing, of unsatisfactory conditions for proper installation of foodservice equipment.

B. Verify wall, column, door, window, and ceiling locations and dimensions. Fabrication and installation should not proceed until dimensions and conditions have been verified and coordinated with fabrication details.

C. Verify that wall reinforcement or backing has been provided and is correct for wall supported equipment. Coordinate placement dimensions with wall construction Section.

D. Verify that ventilation ducts are of the correct characteristics, and in the required locations.

E. Verify that utilities are available, of the correct characteristics, and in the required locations.

3.3 DELIVERY AND INSTALLATION:

A. Delivery:
1. The equipment shall be delivered and installed on schedule. Coordinate all work with the General Contractor and other divisions as required.
2. Deliver materials (except bulk materials) in manufacturer's containers, fully identified with manufacturer's name, trade name, type, class, grade, size, color, item number, area, etc.
3. Contractor is responsible for receiving and warehousing equipment and fixtures, until ready for installation. Store materials, equipment, and fixtures in sealed containers, where possible. Store off the ground and under cover, protected from damage.
4. Contractor to verify and coordinate conditions at the building site, particularly door and/or wall openings, and passages, to assure access for all equipment. Pieces too bulky for existing facilities are to be hoisted or otherwise handled with apparatus as required.
5. Extra charges resulting from special handling or shipment to be paid by the Kitchen Equipment Contractor if insufficient time was allowed in placing factory orders to ensure normal shipment.

B. The work to be accomplished so as not to delay the project construction schedule, interfere or conflict with the work being performed by other contractors. Work to be coordinated and integrated to prevent conflict of work necessitating changes to work already completed. Sequence installation and erection to ensure correct mechanical and electrical utility connections are achieved.

C. Verify all field dimensions before fabrication.

D. Install items in accordance with manufacturer's instructions.

E. Set each item of non-mobile and non-portable equipment securely in place, leveled and adjusted to correct height. Anchor to supporting substrate where indicated, and where required for sustained operation and use without shifting or dislocation. Conceal anchorages wherever possible. Adjust counter tops and other work surfaces to a level tolerance of 1/16” (1.6 mm) (maximum offset, and plus or minus on dimension, and maximum variation in 24" (610 mm) run from level or indicated slope). Provide anchors, supports, bracing, clips, attachments, etc., as required to comply with the local seismic restraint requirements. The Guidelines for Seismic Restraint of Kitchen Equipment, as prepared for the Sheet Metal Industry Fund of Los Angeles and endorsed by S.M.A.C.N.A., is to be followed.

F. Complete field assembly joints in the work (joints which cannot be completed in the shop) by welding, bolting-and-gasketing, or similar methods as indicated and specified. Grind welds smooth and restore finish. Set or trim flush, except for "T" gaskets as indicated. Field joints shall not be visible to the untrained eye.

G. Provide closure plates and strips where required, with joints coordinated with units of equipment.

H. Provide sealants and gaskets all around equipment to wall, ceiling, floors, masonry pads, and adjoining units not portable and with enclosed bodies to make joints airtight, waterproof, vermin-proof, and sanitary for cleaning purposes. Space between all equipment to wall, ceiling, floors, masonry pads, and adjoining units not portable and with enclosed bodies to be completely sealed against entrance of food particles or vermin by means of trim strips, welding, soldering or mastic. Mastic to be General Electric Silicone Construction Sealant Series SE1200 or equal in appropriate color.

I. Joints up to 3/8” (9.5 mm) wide, to be stuffed with backer rod, to shape sealant bead properly, at 1/4” (6 mm) depth.

J. At internal corner joints, apply sealant or gaskets to form a sanitary cove, of not less than 3/8” (9.5 mm) radius.

K. Shape exposed surfaces of sealant slightly concave, with edges flush with faces of materials at joint.

L. Provide sealant filled or gasketed joints up to 3/8” (9.5 mm) joint width. Wider than 3/8” (9.5 mm), provide matching metal closure strips, with sealant application each side of strips. Anchor gaskets mechanically, or with adhesives to prevent displacement.

M. Treat enclosed spaces, inaccessible after equipment installation, by covering horizontal surfaces with powdered borax at a rate of 4 ounces per square foot (1.2 kg/m2).

N. Insulate to prevent electrolysis between dissimilar metals.

O. Cut and drill components for service receptacles, fixtures, piping, conduit, fittings, etc. as required. Grind and polish penetrations to safe tolerance. Work to include welded sleeves, collars, ferrules, or escutcheons.

P. Verify and coordinate the mounting heights of all wall shelves and equipment, with equipment located below them, for proper clearances.

Q. Walk-In Refrigerator/Freezers:
1. The cold storage rooms shall be delivered and installed on schedule by factory supervised and approved installers. Coordinate the work with the General Contractor and other trades, as necessary.
2. Provide the necessary job site coordination with the various trades to ensure job site conditions will meet the requirements of the cold storage rooms.
3. During curing and cleaning of the wearing floors inside the cold storage rooms, the cold storage room doors shall be left open and the rooms well ventilated to prevent damage to the interior. “Keep Out” signs to be posted at each open door.
4. After the installation of the cold storage rooms and prior to the installation of the wearing floor has cured, the cold storage room doors are to be closed and locked.

R. Coordinate with the Plumbing and Electrical Divisions and provide penetrations in foodservice equipment for plumbing and electrical service to and through the fixtures, as required. This includes welded sleeves, collars, ferrules, or escutcheons. These services are to be located so that they do not interfere with intended use and/or servicing of the fixture.

S. All equipment provided by this Section, that require~~s~~ light bulb(s), are to be provided with heavy-duty, energy efficient, extra long-life bulbs with a minimum life expectancy of 5000 hours, and as required by the local Jurisdictions. All light bulbs in and/or above foodservice equipment and/or areas are to be coated or provided with shields in compliance with local health codes.

T. All equipment provided by this Section, shall include any-and-all parts, components, options, accessories, etc. necessary to provide a completely functional item for its intended use under normal conditions; and if appropriate, after the final utility connections are completed by other Divisions. This shall generally apply to equipment such as soda systems, beer systems, and remote refrigeration systems, any type of remote system or equipment, or ice machines; but shall also apply to any equipment provided by this Section.

3.4 COUNTERTOP INSTALLATION:

A. General: Install countertops, except for vanities, over plywood sub-tops with a full spread of water-cleanable epoxy adhesive.

B. Install components plumb, level, and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.
1. Tops:
   a. Flat and true to within 1/8" (3 mm) of a flat surface over a 10' length.
   b. Allow a minimum of 1/16" (1.6mm) to a maximum of 1/8" (3mm)

clearance between surface and each wall.

C. Fit countertops around projections and to adjacent construction. Smooth and clean field cut edges. Ensure that trim will completely cover cut edges.

D. Bond seams with stone seam adhesive and draw tight as countertops are set. Mask areas of countertops adjacent to seams to prevent adhesive smears. Use clamps to ensure countertop units are properly aligned and seams are minimum width.

E. Complete cutouts not finished in shop. Mask areas of countertops adjacent to cutouts while cutting to prevent damage.

F. Install backsplash and end splash by adhering to wall with water-cleanable epoxy adhesive.

G. Leave 1/16-inch (1.6mm) gap between countertop and splash for filling with sealant. Use temporary shims to ensure uniform spacing.

H. Heat isolation for hot food wells, heated deck, and other drop-in heated equipment.
1. Three (3) layers of Nomex insulation held in place with aluminum tape.
2. 16-gauge stainless-steel collar.
3. Heat resistant, food safe silicone caulking.
4. Provide a 1/8” (3 mm) minimum space between the heat source and the insulation.

I. Apply sealant to seams and to gap between countertops and splashes; comply with Section 07 92 00 (07920) "Joint Sealants."

J. Countertop Adjusting and Cleaning:
1. Remove and replace or repair stonework of the following description:
   a. Broken, chipped, stained, or otherwise damaged stones. Broken, chipped, stained, or otherwise damaged stone may be repaired, providing the methods and results are acceptable to Owner’s Representative.
   b. Defective joints.
   c. Stones and joints not matching approved samples.
   d. Stonework not complying with other requirements indicated.
2. Replace in manner that results in stonework matching approved samples and field- constructed mock-ups, complying with other requirements, and showing no evidence of replacement.
3. Clean stone countertops not less than six days after completion of work, using clean water and stiff and soft rags. Do not use wire brushes, acid-type cleaning agents, cleaning compounds with caustic or harsh fillers, or other materials or methods that could damage the stone.

K. Countertop Sealer Application:
1. All surfaces must be clean and free from all loose grit and debris, satins, dirt, and wax coatings. Surfaces shall remain dry for a minimum of 24 hours before the application of sealer and remain dry for 24 hours after the application of sealer.
2. Floor surface temperature must be above 50° F. and below 90° F.
3. Test on a small area before using to determine if the product is acceptable with type of stone.

4. Two (2) uniform coatings of sealer shall be applied before or after installation of stone materials. If prior to installation, adequate documentation shall be included with the material confirming it has been sealed. If after installation, install in strict accordance with Sealer manufacturer's recommendations.

3.5 PROTECTION OF WORK:

A. Use all means reasonable to protect the materials of this Section against theft and damage before, during, and after installation; and to protect the associated work and materials of the other trades.

B. Fabricated fixtures: cardboard, fiberboard or plywood taped to tops and exposed body panels/components.

C. Manufactured Equipment: cardboard, fiberboard or plywood taped as required by equipment shape and installation-access requirements.

D. Prohibited use of equipment includes tool and materials storage, workbench, scaffolding and stacking of construction materials.

E. Damaged Equipment: immediately document and submit to Owner with Contractor's recommendation of action for repair or replacement and its impact on the Project Schedule and Contract Amount.

F. Pre-fabricated walk-in coolers/freezers are not to be used as general storage; and should be locked before leaving the site daily. Damage and theft resulting from failure to secure units will be repaired or replaced at Contractor's expense.

3.6 ADJUSTING:

A. Equipment to be tested for leaks, poor connections, inadequate or faulty performance.
   1. Thermostatically controlled equipment and equipment with automatic features shall be operated for 14 days to prove controls are functioning as intended. Walk-in refrigerators and freezers shall be turned on and ran for a minimum of fourteen days.

B. Refrigeration equipment to run a minimum of three days duration before acceptance.

C. Lubricate and adjust drawer slides, hinges, casters.

D. Adjust pressure regulating valves, timed-delay relays, thermostatic controls, temperature sensors, exhaust hood grilles, etc.

E. Clean or replace faucet aerators, line strainers.

F. Repair, adjust or replace equipment, which is found to be defective in its operation, including units which are below capacity or operating with excessive noise or vibration.

3.7 CLEANING, RESTORING AND REPAIRING:

A. After completion of installation, and completion of other major work in foodservice areas, remove protective coverings and clean foodservice equipment, internally and externally. Repair all damage as a result-of this installation.

B. Restore exposed and semi-exposed finishes removing abrasions and other damages; polish exposed metal surfaces and touch-up painted surfaces. Replace work, which cannot be successfully restored.

C. Polish glass, plastic, hardware and accessories, fixtures, and fittings.

D. Wash and clean equipment and leave in a condition ready for the Owner to sanitize and use.

3.8 TESTING:

A. Delay the start-up of equipment until service lines have been tested, balanced, and adjusted for pressure, voltage and similar considerations; and until water and steam lines have been cleaned and treated for sanitation.

B. Contractor, with assistance from a factory-certified representative from the exhaust hood manufacturer, shall conduct an exhaust hood performance test for each exhaust hood in the Contractor's scope of work at the conclusion-of the project when all hoods and related cooking equipment are in operation. Contractor shall have manufacturer's factory authorized representative test and measure exhaust airflow rates, dampers, switches, demand control ventilation, and sequence of operation, with all appliances at operating temperatures. Contractor shall furnish a written report within ten (10) working days of substantial completion and acceptance of the project by the Owner, indicating the design requirements for each hood and the actual operating parameters as tested and measured.

C. Refrigeration Piping Testing:
   1. Each system shall be pressure tested for leaks. Tests for to be on the high side and on the low side. All valves shall be fully open during last test.
   2. Tests are to be accomplished as follows:
      a. Charge the systems with refrigerant through the port of liquid shut-off valves of the receivers to a pressure of 10 to 20 psi.
      b. Add dry nitrogen, the supply of which shall be equipped with a pressure regulating valve to provide the specified pressure.
      c. Carefully test all joints for leaks using either a Halide torch or an electronic Halogen leak detector.
   3. Precautions to be taken to disconnect the low-pressure controls for protection of the bellows during testing.
   4. Refrigeration System Evacuation:
      a. Evacuation shall be with a vacuum pump with an indicating gauge registering pressure in microns. Pump shall be connected to the system with a 5/8" (15 mm) O.D. line or larger.
      b. Evacuate both high and low sides to 500 microns. Break the vacuum with refrigerant to 0 psi evacuate high and low sides to 100 microns; and then break vacuum to 0 psi. with the refrigerant to be used in the system.

3.9 START-UP AND INSTRUCTIONS:

A. Make-arrangements for demonstration of foodservice equipment operation and maintenance, in advance with the Owner/Operator.

B. Demonstrate foodservice equipment, to familiarize the Owner and the Operator on operation and maintenance procedures, including periodic preventative maintenance measures required. Include an explanation of service requirements and simple on-site service procedures, as well as information concerning the name, address, and telephone number of qualified local source of service. The individual(s) performing the demonstration are to be knowledgeable of operating and service aspects of the equipment.

C. Provide a written report of the demonstration, to the Owner, outlining the equipment demonstrated and malfunctions or deficiencies noted. Identify individuals present at demonstration.

D. Final Cleaning: After testing and start-up, clean the foodservice equipment, and leave in a condition ready for the Owner to sanitize and use.

E. All keys for all locks provided with equipment provided under this Section, are to be gathered up, individually tagged with the equipment they belong to, put into a single box, and handed over to the Owner's authorized representative. A list of the keys and their associated equipment Item numbers is to be provided with the O&M Manuals, along with a copy of the list, signed by the Owner's representative, acknowledging receipt of the keys.

3.10 CLEAR AWAY

A. Throughout the progress of their work, Contractor is to keep the working area free from debris and remove rubbish from premises resulting from work being done by them. At the completion of their work, Contractor is to leave the premises in a clean and finished condition.

3.11 EXISTING EQUIPMENT TO BE USED AFTER COMPLETION OF CONSTRUCTION:

(Applicable only to projects with existing equipment to be used after completion of construction.)

A. Within ten working days of award of contract Contractor is responsible for identifying and recording by means of a spreadsheet with accompanying digital photography and heat-resistant tagging of all existing to remain or to be replaced in previous location or relocated equipment that will be used after completion of construction utilizing item numbers from received contract documents. If such equipment has been removed and relocated, contractor is still responsible for this identification and logging process. Contractor shall verify and coordinate specific equipment with these plans and specifications and verify same with the Owner, Architect and Foodservice Design Consultant. This includes items existing to remain or to be relocated, or to be removed, stored or refurbished and set back in place and used after completion of construction - and the associated work necessary - at the time of the signing of the Contract for the Foodservice Equipment section - and does not include any items added, changed, or damaged (by other than the Contractor) after the signing; except to the extent of work that would have been included with the original existing items. Contractor shall then remove such equipment to the agreed-upon storage location previously assigned and verified by the GC and Owner. Existing equipment to be re-placed in previous location or

re-located and used after completion of construction shall be identified in both storage during construction location and intended final placement location on heat-resistant tag secured to unit by Contractor. Contractor shall also define critical clearances and utilities within this time frame including the testing of actual electrical, plumbing, mechanical values of any equipment without service or factory-applied serial numbered plates. When equipment is removed and re-located or placed back in original location, contractor is responsible for ensuring manufacturer-recommended clearances to walls and adjacent equipment, structural support needs, pour paths, correct MEP rough-in connection values and any applicable fire suppression and exhaust system protection.

B. Remove from existing locations, clean, and renovate/refurbish as noted below, store and re-install existing equipment to be used after completion of construction, in the new locations as shown on plans ready for utility connections, as appropriate. Existing equipment to be used after completion of construction, with utility connections, to be removed after disconnection as noted in paragraph J, below.

C. Perform work in cooperation with Owner, so that normal functioning of services is minimally interrupted. Coordinate all removal and replacement scheduling with the Construction Scheduling Manager (or similar responsible party), to ensure adequate time to complete the necessary work. If adequate time to properly relocate and reset the existing items and complete all cleaning and repair will not be available, due to continuing use of the existing items, or the allotted construction time; contact the Owner and obtain a written agreement as to what work is to be deleted or delayed such as cleaning, repainting, or repairs.

D. All surface dirt, grease, oil, food residues, ingredients, extraneous matter, and other soiling materials is to be removed in order-to obtain minimum acceptable sanitation and foodservice standards. Thorough final rinsing of all cleaning agents to be at a minimum temperature of 180 degrees Fahrenheit (82.2 Centigrade) where possible without damage to equipment or controls. Otherwise, use USDA approved cleaning agents and/or cleaning agents, which are acceptable for use with commercial foodservice equipment. This includes all exterior surfaces of the existing equipment to be reused, and interior work surfaces such as inside oven compartments, fryer vats, ware washers, etc.

E. All painted items with major paint blemishes to be sanded, primed, and repainted to match the original color and type paint. Primer and paint to be of a type approved for use with commercial foodservice equipment. All controls, lights, view windows, non-painted parts, etc. to be protected as recommended by the Manufacturer. Minor paint blemishes can be touched-up in a professional manner. This work is to be included in the Bid Submittal, as a separate line cost, at the end of the Bid Submittal.

F. Replace and/or repair minor broken parts to produce a cleanable and functional item. Repairs and/or parts are for minor required items such as control knobs, handles, pilot lamps, belts, oil changes, minor adjustments, and recalibrations, etc. This does not include addition or replacement of any wearing components such as cutters, blades, etc.; or any accessory components such as mixer beaters, hooks, whips, etc., except for presently existing accessory components which are broken and non-functional, or as noted in the itemized specifications.

G. Where required by local code authorities, provide additional parts and/or modifications to comply with code requirements in place at the time of this project.

H. Where required, remove existing equipment to be used after completion of construction from the premises for repairs, alterations, and cleaning.

I. Refer to schedule on the Foodservice Drawings and to the Itemized Specifications at the end of this section for existing equipment to be used after completion of construction.

J. Disconnection of existing equipment to be relocated and/or existing equipment to be used in its found place after completion of construction and disconnection and removal/disposal of existing equipment that will not be used after completion of construction, is work as designated by the Architect, and not included in this Section. (See page 11 40 00-2, 1.3.F.)

K. Cost estimates for any repairs and/or parts more than the minor items stated above, or repairs requiring significant disassembling of the item, should be submitted to the Owner for consideration and approval as an addition to the Contract. In general, this would be considered as any repairs and/or parts amounting to an estimate up to 10% of the cost of a comparable new item. Any item, which would require repairs and/or parts amounting to an estimate up to 25% or more, should include an alternate cost for supplying a comparable new item as a consideration by the Owner, and an addition to the Contract. Estimates are for each existing equipment to be used after completion of construction only that require repairs and/or parts, and only to the extent that work is required; and should not be considered as a lump-sum estimate on all existing equipment to be used after completion of construction combined, or as an allowance for adding accessories or options.

3.12 ITEMIZED SPECIFICATIONS:

A. Refer to the following pages for specific-information on each item included in this Section.

(Remainder of page left blank intentionally.)

ITEM #A1 SERVING COUNTER; QTY: 1, N.I.K.E.C.- BY ARCHITECT/G.C.

ITEM #A2 POS SYSTEM; QTY: 1, N.I.K.E.C.- BY OWNER/OPERATOR

ITEM #A3 REFRIGERATED MERCHANDISER

Quantity: One (1)
Manufacturer: True Mfg. - General Foodservice
Model: GDM-49-HC~TSfL01

Furnish and set in place per manufacturer's standard specifications and the following:

1. Refrigerated Merchandiser, two-section, True standard look version 01, (8) shelves, (2) double pane thermal insulated glass hinged doors, LED interior lights, powder coated steel exterior, white interior with stainless steel floor, R290 Hydrocarbon refrigerant, 1/2 HP, cULus, UL EPH Classified, Made in USA, ENERGY STAR®
2. Self-contained refrigeration standard
3. Exterior: Black powder coated steel, standard
4. Interior: White aluminum, with white shelving, standard
5. Left door hinged left, right door hinged right standard
6. Coordinate illuminated sign decal/graphic with Architect/ID

ITEM #A4 FREEZER MERCHANDISER

Quantity: One (1)
Manufacturer: True Mfg. - General Foodservice
Model: GDM-26F-HC~TSL01

Furnish and set in place per manufacturer's standard specifications and the following:

1. Freezer Merchandiser, one-section, True standard look version 01, -10°F, (4) shelves, (1) triple-pane thermal glass hinged door, LED interior lights, powder coated steel exterior, white interior with stainless steel floor, R290 Hydrocarbon refrigerant, 1 HP, cULus, UL EPH Classified, Made in USA
2. Self-contained refrigeration standard
3. Exterior: Black powder coated steel
4. Interior: White aluminum, with white shelving, standard
5. Door hinged right standard
6. Coordinate illuminated sign decal/graphic with Architect/ID

ITEM #B1 DRY STORAGE SHELVING

Quantity: Sixteen (16)
Manufacturer: Metro
Model: METROSEAL 3

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Length, width and configuration per plan and verified room dimensions.
2. Super Erecta Metroseal 3 wire shelving. Corrosion-resistant green epoxy finish, with Microban® antimicrobial protection.
3. 86" High with five tiers.
4. Each section shall be free-standing with four legs.

ITEM #B2 BAG-N-BOX SODA RACK; QTY: 1, N.I.K.E.C.- BY PURVEYOR

ITEM #B2.1 WATER FILTRATION SYSTEM, PARTS & ACCESSORIES

Quantity: One (1)
Manufacturer: Everpure
Model: EV929322

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Coldrink/Insurice Water Filtration Manifold, Coldrink/Insurice Twin, (1) EC210 prefilter, (1) Coldrink/Insurice Twin Manifold, mounting bracket, built-in water shut-off valve, outlet pressure gauge, 3/4" inlet, 3/4" outlet (EV929322)

ITEM #B2.2 SODA SYSTEM CONDUIT - ENTRANCE; QTY: 1, N.I.K.E.C.- BY ELECTRICAL DIVISION

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Beverage conduit details to be similar to standard detail MEP3-1. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.

ITEM #B2.3 75 LB CO2 TANK; QTY: 1, N.I.K.E.C - BY PURVEYOR

ITEM #B3 SPARE NO.

ITEM #B4 WALK-IN COOLER

Quantity: One (1)
Manufacturer: American Panel
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. See plans for size and configuration. Walk-in cooler or freezer to be prefabricated of modular design and construction. Walk-in boxes to be installed by an American Panel - approved installation team.
2. Refer to manufacturer's drawings in QF-700 sheet series for further information.
3. All walk-in panels shall be provided with an overall thickness of 4" (100mm).
4. Floor to be set onto existing floor prepared by the G.C. defined in manufacturer's drawings and in foodservice plans. Provide with Amerituff structural floor with 1/8" integral diamond aluminum tread plate with 3/4" plywood underlayment and fiberglass grating support.
5. Panels shall consist of interior and exterior metal skins precisely formed with steel dies as fabricated on metal folding machines and thoroughly checked with gauges for accuracy. The insulation shall be "Foamed-In Place" (not laminated) and when completely heat-cured, bind tenaciously to the metal skins to form a rigid 4" (104mm) thick insulated panel. Urethane shall be CFC free high pressure impingement mixed, not poured or frothed. To ensure tight joints, panel edges must have foamed-in-place tongues and grooves which are of the same density as the rest of the panel. A flexible vinyl gasket, which is also foamed in place (not glued or stapled) shall extend around the interior and exterior perimeter of all tongue edges. Gaskets shall be resistant to damage from oil, fats, water and detergents and must be NSF-approved. Foam core of panels shall be Underwriters Laboratories-listed as having flame spread of 20 or lower and smoke generation of 350 or lower when tested in accordance with ASTME-84-76 and certified with a UL Label. Panels shall be approved as a Class I building type. They shall be foamed using a high impingement mixing process utilizing Enovate™3000 or equal HFC expanding agents (zero ozone depleting). Panels shall comply with the Federal Energy Independence and Security Act of 2007 with minimum R-values tested per the code of R25 for 4" cooler panels and R32 for 4" Freezer panels. All panels except corner panels shall be made in 23" and 46" widths, fully interchangeable for fast, easy assembly. Panels 11-1/2", 17-1/4" or 34-1/2" wide are to be furnished only if required to fit the allocated space. Custom width panels shall be provided to meet non-nominal sizes. To assure perfect alignment and maximum strength, corner panels shall employ a right-angle configuration with exterior horizontal dimensions of 12" on each side. Vertical panels (except corner panels) shall be supplied in a single length up to 28' high (16' high for installations with aluminum or stainless-steel finish). Panels shall be equipped with diaphragmatic joining devices. The distance between locks shall not exceed 46". Each device shall consist of a cam action, hooked locking arm placed in one panel, and a steel rod positioned in the adjoining panel, so that when the arm is rotated, the hook engages the rod and draws the panels tightly together with cam action. Arms and rods shall be housed in individual steel pockets
6. Interior ceiling finish shall be .040" white smooth aluminum.
7. Interior walls shall be .040" white embossed aluminum. All interior walls to be finished with Boston Series 2000 grey in color rigid vinyl extruded bumper rail set at 18" and 60" AFF.
8. Exterior finish, where exposed shall be .032" white embossed aluminum. Balance of exterior finish un-exposed to be Stucco Acrylume. All exposed exterior walls and doors to be complete with 1/8" thick aluminum diamond tread plate to 36" AFF glued to walls and sealed with epoxy sealant topped with Boston Series 2000 grey in color rigid vinyl extruded bumper rail at top. Wainscot to begin at top of sanitary base. Provide heavy duty corner guards at exposed corners to 96" AFF where applicable.
9. Where swing doors are shown in plan, provide doors sized per plan and frame numbered per plan. Door to be hinged as shown on plan, complete with three hinges. The door to be flush type, constructed and insulated in the same manner as the wall panels, and finished inside and out, to match adjacent walls. Door to be complete with 1/8" thick aluminum diamond tread kick plate to 36" AFF inside and out. Door and door section to be further equipped with the following:
    a. Three (3) Kason 1277 strap hinges; one (1) Kason 27C polished chrome handle/locking deadbolt latch complete with a safety release to prevent entrapment of personnel within the box.

b. Provide door section with an incandescent type vapor-proof light with clear globe and heavy-duty LED clear bulb, pilot light switch and conduit between switch box and receptacle box. All conduit and wiring to be concealed, where possible.
c. Door to be complete with heavy-duty Kason Thermal Flex bi-parting vinyl strip door, heated viewport and LCN 4011 door closer . Door buck to be coordinated with finished floor elevation to allow minimum door sweep exposure at threshold interface. Threshold at door to be constructed of 10-gauge stainless steel tread plate 8” in depth to be secured in the center of the door threshold reaching 2” beyond the cooler wall face in and out. Threshold to be secured to floors with stainless steel countersunk fasteners.
d. Kason 1825 heated pressure relief port (air-vent) for all door sections.
e. IC+ Monitoring and alarm system shall incorporate an integrated light switch with automatic light off and 3-way & 4-way capability; temperature monitor and logger with high temperature and low temperature visual and audio alarm for Fahrenheit or Celsius temperature selection; integrated dry contact for alarm signaling (@24VAC, @30VDC); door and window heater control, HACCP preview via onboard LCD screen; HACCP download via USB; WIFI connectivity; battery backup; temperature alarm notification via email and/or email to SMS text messages when connected to facility local WIFI network; automatic and on-demand transmission of HACCP data via email; adaptive settings; door switch to enable door ajar alarm, door ajar notification via email and/or email to SMS text messages and automatic lights on when door opens; panic alarm with illuminated panic button, alarm buzzer with LED and notification via email and/or email to SMS text messages.
f. Magnetic core gaskets on the top edge and both sides of the door shall keep the door in a closed position, forming a tight seal; a flexible, dual-blade wiper gasket shall be installed at the bottom of the door. NSF-approved gaskets shall be replaceable and resistant to damage from oil, fats, water and detergent.
g. Door shall have reinforcing type of frame around entire perimeter of the door opening to prevent racking or twisting and for hardware attachment. Reinforcing frame shall have thermal breaker.
h. Provide 14” x 14” viewport, heated frame and glass for 4” thick door.

10. Provide extra low temperature LED light fixtures with heavy duty tubes for field installation by the Electrical Division. All light fixtures to be U.L. listed for use inside walk-in cooler or freezer. All conduit and wiring between light fixtures to be concealed where possible. Refer to foodservice walk in electrical plan for number and location of light fixtures. Provide lighting inside walk-in to meet or exceed 10 foot-candles as measured at 12" above finish floor.
11. Fan Control Switch: Intermatic FF330M with electrical stub out through the ceiling panel above the door section to allow the electrical trades to provide a connection to the evaporator(s); operator can turn evaporators fan(s) off and they will resume automatically when this times out.
12. Matching finish trim strips, from floor to ceiling, at all exposed vertical edges, corners, and joints to building wall(s). Kitchen Equipment Contractor is responsible for verifying dimensions.
13. Matching finish closure panels from top of walk-in to finished ceiling, on exposed sides. Kitchen Equipment Contractor is responsible for verifying dimensions, and for providing access panels as necessary, verify with Architect.
14. Unit and all components to be N.S.F. Approved, U.L. and U.L. Classified with a flame spread of 20 or less and meet the requirements of N.S.F. Standard #7.
15. For any installation requiring additional ceiling support for equipment above or due to span length, provide self-supporting ceiling structural framework over the top of the walk-in compartment(s), and supported by the walk-in walls according to American Panel details.
16. Verify all dimensions with building conditions for proper fit. Provide maximum size possible to fit available space, using standard panels.
17. All penetrations to be sealed with approved expandable foam insulation and approved silicone sealant.

18. Provide required additional walk-in box ceiling support for any equipment planned to be mounted on top of box or required access by maintenance staff on box top.
19. Provide walk-In in compliance with Miami-Dade NOA requirements for outdoor walk-ins. Including all requirements regarding securing mechanisms, structural reinforcement, roofing, etc..

ITEM #B4.1 COOLER EVAPORATOR COIL - INCLUDED IN ITEM B115 COMPRESSOR RACK

Quantity: One (1)
Manufacturer: RDT
Model: IR1-1

Fabricate/Furnish and set-in place per plans, details, and the following:

1. The system shall be an "UL Listed" air-cooled package system for indoor installation. Pre-wired to main fused disconnect switch and pre-piped for single point connection. Flush mounted internal electrical panel. The condenser shall be multi circuited with aluminum fin copper tube and shall be designed for 10 degrees to 20degrees TD.

ITEM #B5 COOLER STORAGE SHELVING

Quantity: Ten (10)
Manufacturer: Metro
Model: METROMAX (Q)

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Length, width and configuration per plan and verified walk in cooler dimensions.
2. MetroMax (Q) Open Grid Mat Shelving.
3. 86" High With Five Tiers.
4. Each section shall be free-standing with four legs.

ITEM #B6 WALK-IN FREEZER - INCLUDED IN ITEM B4

Quantity: One (1)
Manufacturer: American Panel
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Provide per details found in Item #B4.

ITEM #B6.1 FREEZER EVAPORATOR COIL - INCLUDED IN ITEM B115 COMPRESSOR RACK

Quantity: One (1)
Manufacturer: RDT
Model: IR1-1

Fabricate/Furnish and set-in place per plans, details, and the following:

1. The system shall be an "UL Listed" air-cooled package system for indoor installation. Pre-wired to main fused disconnect switch and pre-piped for single point connection. Flush mounted internal electrical panel. The condenser shall be multi circuited with aluminum fin copper tube and shall be designed for 10 degrees to 20degrees TD.

ITEM #B7 FREEZER STORAGE SHELVING

Quantity: Six (6)
Manufacturer: Metro
Model: METROMAX (Q)

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Length, width and configuration per plan and verified walk in cooler dimensions.
2. MetroMax (Q) Open Grid Mat Shelving.
3. 86" High With Five Tiers.
4. Each section shall be free-standing with four legs.

ITEM #B8 SPARE NO.

ITEM #B9 SPARE NO.

ITEM #B10 SPARE NO.

ITEM #B11 MOP SINK CABINET

Quantity: One (1)
Manufacturer: Eagle Group
Model: F1916-VSCS

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Mop Sink Cabinet, single width, 25"W x 22-1/4"D x 84-1/4"H, slanted top, holds (2) mops, (2) hinged doors with transverse rod handles & keyed locks, 8" deep mop sink with service faucet, (1) 12"D fixed overhead shelf, includes 30" spray hose & spray hose bracket, 430 stainless steel construction, NSF

ITEM #B12 SPARE NO.

ITEM #B13 SPARE NO.

ITEM #B14 CLEAN DISH STORAGE SHELVING

Quantity: One (1)
Manufacturer: Metro

Model: METROMAX (Q)

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Metro length, width and configuration per plan and verified room dimensions.
2. MetroMax (Q) open grid mat shelving.
3. Provide enclosure panels on three (3) sides. Bottom of enclosure panels to be set 6" above finished floor.
4. Configure unit so that carts fit under bottom shelf.
5. Each section to be free-standing with four legs.
6. 74" High with three tiers.
7. Each section to have two (2) #5MPX polyurethane swivel casters and two (2) #5MPBX polyurethane casters with brakes.

ITEM #B15 AGITATING POT SINK

Quantity: One (1)
Manufacturer: Aerowerks
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Unlimited pot, pan & sheet pan washing system c/w electric heat, ultrawash motor, ultrawash labels, auto fill, soiled end drainboard, standard controls, 48” wash sink, 24” rinse sink, 24” sanitizer sink, three drains with overflow (for wash, rinse, and sanitizer sinks), clean end drain board, pre rinse sink w/ removable perforated scrap basket, (02) pre rinse faucets, sheet pan rack and utensil basket.
2. For further details, see QF800 series drawings

ITEM #B15.1 PRE-RINSE FAUCET ASSEMBLY

Quantity: One (1)
Manufacturer: T&S Brass
Model: B-0133-BR-B

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Pre-Rinse Unit, 8" wall mount, supply stops-hoses-elbows, 36" hose, spray, brush, 12" wall bracket

ITEM #B16 WALL SHELF, TUBULAR

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Tubular wall shelf to be similar to standard detail FSD12-8A. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
2. Provide wall shelves in length, width, and configuration as shown on plans.

ITEM #B17 WALL FLASHING

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Similar to standard detail FSD1-39. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
2. Provide 20 gauge stainless steel panels from top of coved tile base to ceiling.

ITEM #B18 TRASH RECEPTACLE, 23 GALLON; QTY: 2, N.I.K.E.C.- BY OWNER/OPERATOR

ITEM #B19 HAND SINK ASSEMBLY

Quantity: One (1)
Manufacturer: Eagle Group
Model: YHFL-5000-0013-00

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hand Washing System, includes hand sink with integral (welded) left and right side splashes, electronic eye splash mounted T&S faucet with battery saving hydro generator power source, touchless hand sanitizing dispenser, hands free soap dispenser, automated touchless paper towel dispenser, food handler glove rack, white bristle nail brush, with stainless steel skirt assembly in lieu of trash receptacle & end splashes on both ends, 304 stainless steel, NSF

ITEM #B20 SPARE NO.

ITEM #B21 SPARE NO.

ITEM #B22 SPARE NO.

ITEM #B23 BUN / SHEET PAN RACK

Quantity: Three (3)
Manufacturer: Cres Cor
Model: 2071812

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Utility Rack, mobile, angle ledge, full height, open sides, riveted pan slides with extruded angles, 5-1/8" centers, (24) 14" x 18" tray or (12) 18" x 26" pan capacity, end loading, fully welded Hi-Tensile aluminum frame construction, (4) 5" swivel casters (2) braked, NSF

ITEM #B24 CART, UTILITY/BUSSING

Quantity: Two (2)
Manufacturer: Lakeside Manufacturing
Model: 2521

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Deep Well Utility Cart, (2) 30-1/3"W x 16"D shelves with 3" lip on all sides, angle legs reinforced with gussets, 500 lb. capacity, 19" shelf clearance, dent resistant, integrated push handle on each short side, structural foam plastic construction, 5" non-marking casters: (2) swivel & (2) fixed, gray.

ITEM #B25 SPARE NO.

ITEM #B26 SPARE NO.

ITEM #B27 ICE MAKER, CUBE-STYLE

Quantity: One (1)
Manufacturer: Hoshizaki
Model: KM-1301SAJ

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Ice Maker, Cube-Style, 48"W, air-cooled, self-contained condenser, production capacity up to 1365 lb/24 hours at 70°/50° (1301 lb AHRI certified at 90°/70°), crescent cube style, stainless steel exterior, R-refrigerant, NSF, UL

ITEM #B27.1 ICE BIN FOR ICE MACHINES

Quantity: One (1)
Manufacturer: Hoshizaki
Model: B-800SF

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Ice Bin, 48"W, top-hinged front-opening door, 800-lb ice storage capacity, for top-mounted ice makers, stainless steel exterior, painted legs included, protected with H-GUARD Plus Antimicrobial Agent, ETL, ETL-Sanitation

ITEM #B27.2 WATER FILTRATION SYSTEM, PARTS & ACCESSORIES

Quantity: One (1)
Manufacturer: Everpure
Model: EV929322

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Coldrink/Insurice Water Filtration Manifold, Coldrink/Insurice Twin, (1) EC210 prefilter, (1) Coldrink/Insurice Twin Manifold, mounting bracket, built-in water shut-off valve, outlet pressure gauge, 3/4" inlet, 3/4" outlet (EV929322)

ITEM #B28 FLOOR TROUGH & GRATE

Quantity: One (1)
Manufacturer: Eagle Group
Model: FT-1236-SG

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Floor Trough, 36"W x 12"D, stainless steel subway-style grating, 4" deep trough pan with built-in pitch toward drain, accommodates up to 4" drain pipe, stainless steel removable perforated basket, 1" outer flange for mounting, all-welded 14/304 stainless steel construction, NSF

ITEM #B29 WORK TABLE, MOBILE

Quantity: Two (2)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Work table, see plans for width, length, height, and configuration.
2. Standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions. Similar to standard details FSD1-7 and FSD1-10.
3. Island work table with undershelf, similar to detail FSD2-6.
4. 5" Heavy-duty casters, two (2) with brakes.
5. Straight turn-down edge profile similar to detail FSD1-1A.

ITEM #B30 SCALE

Quantity: One (1)
Manufacturer: LeanPath
Model: TRACKER 2.2

ITEM #B31 SPARE NO.

ITEM #B32 SPARE NO.

ITEM #B33 SPARE NO.

ITEM #B34 WORK TABLE W/ SINK

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Work table with sink, see plans and elevations for width, length, height, and configuration.
2. Standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions. Similar to standard details FSD1-7 and FSD1-10.
3. Island work table with undershelf, similar to detail FSD2-6.
4. Provide single integral sink similar to detail FSD2-8. Size and location as shown on plans and on elevations. Provide rotary waste assembly with overflow and lever bracket similar to detail FSD1-13.
5. Provide one (1) T&S B-0221 (or Fisher equal) deck mount faucet (12" spout) with wrist-action handles.
6. Ship Hand Sink Item B34.1 to Fabricator to install in table at factory. As per plan mount to underside of table, fully weld and polish all edges.
7. Provide open space for under-counter equipment as shown on plans. Coordinate fabrication so that equipment fits completely under top.
8. Straight turn-down edge profile similar to detail FSD1-1A.
9. Provide receptables in table as show for undercounter Refer/freezer as shown in plans and section & elevations.
10. Utility Chase to be similar to standard detail FSD1-41. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.

ITEM #B34.1 HAND SINK

Quantity: One (1)
Manufacturer: Eagle Group
Model: HWB-T

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Drop-In Hand Sink, one compartment, 17-1/2" x 16-1/2" x 17-1/4"H, type 304 stainless steel welded construction, 9-1/4" x 11-1/2" x 6" bowl, bullnose front edge, T&S deck mount gooseneck faucet, basket drain, soap on rear deck, C-fold towel dispenser, hinged door with pull handle & magnetic catch, NSF
2. Ship to Fabricator to Install in Work table with sink Item B34.
1. Mount to underside of table, fully weld and polish all edges

ITEM #B35 TRASH RECEPTACLE, 23 GALLON; QTY: 2, N.I.K.E.C.- BY OWNER/OPERATOR

ITEM #B36 UTENSIL RACK, CEILING MOUNTED

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Provide ceiling mounted utensil rack size and configuration as shown on plan, similar to standard detail FSD14-3.
2. Provide as shown on QF500 series Foodservice Fabrication Details sheets.

ITEM #B37 UNDERCOUNTER FREEZER

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: DF48N-U-D

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Designer Line Undercounter Freezer, 48"W, two-section, (4) drawers, accommodates (1) 12 x 18 x 6 pan per drawer or (1) 1/2 x 6 pan & (1) 1/3 x 6 pans per drawer capacity (supplied by others), stainless steel exterior & interior, stainless steel top, 1-3/8" diameter plate casters, front breathing, electronic control with digital display, hi-low alarm, rear mounted self-contained refrigeration, R290 hydrocarbon refrigerant, 1/2 HP, cETLus, NSF
2. Cord & plug, standard

ITEM #B38 UTENSIL RACK, CEILING MOUNTED

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Provide ceiling mounted utensil rack size and configuration as shown on plan, similar to standard detail FSD14-3.
2. Provide as shown on QF500 series Foodservice Fabrication Details sheets.

ITEM #B39 UNDERCOUNTER REFRIGERATOR

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: D48N-U

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Designer Line Undercounter Refrigerator, 48"W, two-section, (2) field rehingeable doors, stainless steel exterior & interior, stainless steel top, 1-3/8" diameter plate casters, front breathing, electronic control with digital display, hi-low alarm, rear mounted self-contained refrigeration, R290 hydrocarbon refrigerant, 1/5 hp, cETLus, ENERGY STAR®
2. cord & plug, standard
3. Doors hinged per plan

ITEM #B40 SPARE NO.

ITEM #B41 SPARE NO.

ITEM #B42 SPARE NO.

ITEM #B43 SPARE NO.

ITEM #B44 WORKTABLE W/ SINK

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Worktable with sink, see plans and elevations for width, length, height, and configuration.
2. Standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions. Similar to standard details FSD1-7 and FSD1-10.
3. Island work table with undershelf, similar to detail FSD2-6.
4. Provide single integral sink similar to detail FSD2-8. Size and location as shown on plans and on elevations. Provide rotary waste assembly with overflow and lever bracket similar to detail FSD1-13.
5. Provide one (1) T&S B-0221 (or Fisher equal) deck mount faucet (12" spout) with wrist-action handles.
6. Straight turn-down edge profile similar to detail FSD1-1A.
7. Provide open space for under-counter equipment as shown on plans. Coordinate fabrication so that equipment fits completely under top.
8. Provide receptables in table as show for undercounter Refer/freezer as shown in plans and section & elevations.
9. Utility Chase to be similar to standard detail FSD1-41. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.

ITEM #B45 TRASH RECEPTACLE, 23 GALLON; QTY: 2, N.I.K.E.C.- BY OWNER/OPERATOR

ITEM #B46 SPARE NO.

ITEM #B47 UNDERCOUNTER REFRIGERATOR

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: D48N-U-D

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Designer Line Undercounter Refrigerator, 48"W, two-section, (4) drawers, accommodates (1) 12 x 18 x 6 pan per drawer or (1) 1/2 x 6 pan & (1) 1/3 x 6 pans per drawer capacity (supplied by others), stainless steel exterior & interior, stainless steel top, 1-3/8" diameter plate casters, front breathing, electronic control with digital display, hi-low alarm, rear mounted self-contained refrigeration, R290 hydrocarbon refrigerant, 1/5 hp, cETLus
2. Cord & plug, standard

ITEM #B48 UNDERCOUNTER REFRIGERATOR

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: D48N-U

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Designer Line Undercounter Refrigerator, 48"W, two-section, (2) field rehingeable doors, stainless steel exterior & interior, stainless steel top, 1-3/8" diameter plate casters, front breathing, electronic control with digital display, hi-low alarm, rear mounted self-contained refrigeration, R290 hydrocarbon refrigerant, 1/5 hp, cETLus, ENERGY STAR®
2. Cord & plug, standard
3. Doors hinged per plan

ITEM #B49 UTENSIL RACK, CEILING MOUNTED

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Provide ceiling mounted utensil rack size and configuration as shown on plan, similar to standard detail FSD14-3.
2. Provide as shown on QF500 series Foodservice Fabrication Details sheets.

ITEM #B50 WORK TABLE, MOBILE

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Work table, see plans for width, length, height, and configuration.
2. Standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions. Similar to standard details FSD1-7 and FSD1-10.
3. Island work table with undershelf, similar to detail FSD2-6.
4. 5" Heavy-duty casters, two (2) with brakes.
5. Straight turn-down edge profile similar to detail FSD1-1A.

ITEM #B51 FOOD PACKAGING MACHINE

Quantity: One (1)
Manufacturer: Invacus
Model: BOXER 35 COMBIVAC

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Henkelman BOXER 35 COMBIVAC™ Vacuum Packaging Machine, countertop, 13-1/2"W x 14-1/2"D x 6"H chamber, (1) removable 13-1/2"W double wire front seal bar, COMBIVAC™ sensor controls with (20) program presets & pump maintenance cycle, 678 cf/h (19 m^3/h) capacity Busch vacuum pump, automatic transparent lid, USB port, includes filler plates, stainless steel construction, 0.75 HP, , 6ft. cord, ETL-Sanitation, cETLus, CE
2. (1) Seal bar front, standard
3. Double seal, standard
4. Service Kit, for standard maintenance

ITEM #B52 SPARE NO.

ITEM #B53 SPARE NO.

ITEM #B54 SPARE NO.

ITEM #B55 MAKE UP AIR DIFFUSER

Quantity: Four (4)
Manufacturer: Halton Company
Model: KCD

Fabricate/Furnish and set-in place per plans, details, and the following:

1. 24"x48" ceiling diffuser. Provide as shown on QF-500 sheet series drawings.

ITEM #B56.1 EXHAUST HOOD

Quantity: One (1)

Manufacturer: Halton Company
Model: KVM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Halton KVM Filter Type Exhaust Hood with Capture Jet™ 2nd generation system.
2. Provide per fabricator's detail drawings in QF-700 sheet series. Halton drawing number reference U24-599.
3. The canopy shall bear UL or ETL labels and be listed as “range hood without exhaust fire damper” per standard 710 and be fabricated in compliance with NFPA-96 and shall bear the National Sanitation Foundation seal of approval.
4. The canopy inner liner shall be 100% 18-gauge stainless steel, type 304 with #4 finish. Each canopy shall have a filter housing of the same material as the canopy liner. The filter housing shall be equipped with a concealed drip tray the full length of the canopy and with a grease cup for easy removal and daily cleaning.
5. The exhaust airflow will be based on the convective heat generated by the appliances underneath each canopy. Submittal shall include convective heat calculations based on the input power of the appliance served and efficiency of hood system consistent with results of independent test based on ASTM Standards F-1704-05 Capture & Containment and F-2474-05 Heat Gain to Space.
6. Final air volume calculations shall comply with the hood listing. The use of end panels or rear seals to achieve required airflows are not acceptable. Use of Capture Walls to create a seal between cooking equipment and wall shall not be used as they require cooking equipment to be located further from wall reducing isle space
7. The Capture Jet air shall be introduced through a special discharge panel and shall not exceed 15% of the calculated exhaust airflow. The Capture Jet discharge velocity will be a minimum of 1500 FPM. Slot type discharge shall not be used. The Capture Jet air increases the capture efficiency of the smoke and contaminated air at both the face and sides of the hood. The Capture Jet chamber is to be fully insulated.
8. Provide hood pre piped for Fire Suppression System. Final connections to hood duct collar(s) by the Mechanical Division. Hood construction and components to be UL and NSF listed. Provide hood mounted switch panel for fan and lights. Mounting height of bottom edge of hood to be 6'-8" above finished floor. Verify and coordinate all dimensions, and duct requirements and locations with site and Mechanical Division. See ventilation drawing sheet for general size and location of duct(s). If not installed against the finished ceiling, provide matching stainless steel closure panels above hood to finished ceiling, to conceal duct(s) and hood fire suppression system piping; verify height.
9. The hood shall be equipped with model KSA multi-cyclone stainless steel grease extractors. Filters shall be rated at 93%-98% extraction efficiency on particulates in the 5-10-micron range based on ASTM Standard F-2519-05. The pressure loss over the extractor shall not exceed 0.50" of water at flow rates approved by UL for heavy load cooking. Sound levels shall not exceed an NC rating of 55. Baffle or slot type extractors shall not be used. The hood shall be supplied with a control panel on the face of the hood consisting of: Exhaust Fan Switch with pilot light. Light Switch with pilot light. Hangers, supports and miscellaneous accessories as required for installation. The installation shall be in accordance with the manufacturer's recommendations and conform to NFPA-96 guidelines and all applicable local codes. Air space at wall(s) to accommodate requirements of the latest edition of NFPA 96 clearance to combustibles. All welded duct collar(s). Provide with stainless steel compartment at end of hood for housing Fire Suppression System, if shown on drawings.
10. Hood shall be provided with hood mounted temperature sensor and control panel designed and installed to automatically activate the exhaust fan whenever cooking operation occurs. The activation of the exhaust fan shall occur through and interlock with the cooking appliances, by means of heat sensor, per IMC 2006 507.2.1.1 requirements.

11. Hood shall provide provisions for the Halton Safeguard system including M.A.R.V.E.L. demand control system, AirWatch IEQ sensor, and Fire Watch early fire warning system. System shall include Halton Infrared Radiation Index Sensors (IRIS). Temp only systems shall not be allowed. System provided with model ABD automated balancing dampers to modulate airflow at each individual hood section. System shall be provided with BACnet gateway for direct communication to BMS and control panel with touchscreen for user interface. (1) control panel shall be provided for hood. System provided with Halton model KGS grease sensing system to monitor grease build-up in exhaust ductwork, signaling the operator when grease accumulation in ductwork exceeds NFPA cleaning required levels.
12. Provide and install Halton Patent Pending LED light fixture with the following certifications U.L., CSA, NSF and CE for use in grease exhaust hoods in quantity sufficient to provide 50 foot candles at the 36" A.F.F. cooking surface when hood is mounted 84" A.F.F. Halton LED light fixture is complete with die cast aluminum junction box with integral fins for natural heat dissipation. Input voltage of 24VDC with a power consumption not to exceed . The housing encases 24 LED light emitters with a brightness of 1000 lumens. Lighting color shall be cool white (fluorescent). Lamp body is stainless steel ring with a high temperature silicone seal. Junction box to accept standard ½" NPT fitting. Fixture shall come complete with integral power supply with an input voltage of 108VAC 305VAC and input frequency of 50/60 Hz. Input current rating shall be @ 120VAC. Fixture shall contain no mercury or lead.
13. This hood is to be integrated into a MARVEL system. It is the intent of this specification that the exhaust hood, fire suppression system, and supply air plenum, Automatic Balancing Dampers (ABD), and MARVEL control panel are to be provided and installed by the Kitchen Equipment Contractor. The VFD's are to be located, supplied and installed by the Mechanical Contractor.
14. Switch Panel to include Hood ON/OFF Light Switch and Fan ON/OFF Switch. Switch Panel to be Remote Mounted.
15. Kitchen Equipment Contractor (K.E.C.) shall provide fire wrap insulation on top of the hood if required by local code authority.
16. Provide with KCD supply air diffusers as shown on hood detail drawings.

ITEM #B56.2 EXHAUST HOOD

Quantity: One (1)
Manufacturer: Halton Company
Model: KVM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Halton KVM Filter Type Exhaust Hood with Capture Jet™ 2nd generation system.
2. Provide per fabricator's detail drawings in QF-700 sheet series. Halton drawing number reference U24-599.
3. The canopy shall bear UL or ETL labels and be listed as “range hood without exhaust fire damper” per standard 710 and be fabricated in compliance with NFPA-96 and shall bear the National Sanitation Foundation seal of approval.
4. The canopy inner liner shall be 100% 18-gauge stainless steel, type 304 with #4 finish. Each canopy shall have a filter housing of the same material as the canopy liner. The filter housing shall be equipped with a concealed drip tray the full length of the canopy and with a grease cup for easy removal and daily cleaning.
5. The exhaust airflow will be based on the convective heat generated by the appliances underneath each canopy. Submittal shall include convective heat calculations based on the input power of the appliance served and efficiency of hood system consistent with results of independent test based on ASTM Standards F-1704-05 Capture & Containment and F-2474-05 Heat Gain to Space.

6. Final air volume calculations shall comply with the hood listing. The use of end panels or rear seals to achieve required airflows are not acceptable. Use of Capture Walls to create a seal between cooking equipment and wall shall not be used as they require cooking equipment to be located further from wall reducing isle space
7. The Capture Jet air shall be introduced through a special discharge panel and shall not exceed 15% of the calculated exhaust airflow. The Capture Jet discharge velocity will be a minimum of 1500 FPM. Slot type discharge shall not be used. The Capture Jet air increases the capture efficiency of the smoke and contaminated air at both the face and sides of the hood. The Capture Jet chamber is to be fully insulated.
8. Provide hood pre piped for Fire Suppression System. Final connections to hood duct collar(s) by the Mechanical Division. Hood construction and components to be UL and NSF listed. Provide hood mounted switch panel for fan and lights. Mounting height of bottom edge of hood to be 6'-8" above finished floor. Verify and coordinate all dimensions, and duct requirements and locations with site and Mechanical Division. See ventilation drawing sheet for general size and location of duct(s). If not installed against the finished ceiling, provide matching stainless steel closure panels above hood to finished ceiling, to conceal duct(s) and hood fire suppression system piping; verify height.
9. The hood shall be equipped with model KSA multi-cyclone stainless steel grease extractors. Filters shall be rated at 93%-98% extraction efficiency on particulates in the 5-10-micron range based on ASTM Standard F-2519-05. The pressure loss over the extractor shall not exceed 0.50" of water at flow rates approved by UL for heavy load cooking. Sound levels shall not exceed an NC rating of 55. Baffle or slot type extractors shall not be used. The hood shall be supplied with a control panel on the face of the hood consisting of: Exhaust Fan Switch with pilot light. Light Switch with pilot light. Hangers, supports and miscellaneous accessories as required for installation. The installation shall be in accordance with the manufacturer's recommendations and conform to NFPA-96 guidelines and all applicable local codes. Air space at wall(s) to accommodate requirements of the latest edition of NFPA 96 clearance to combustibles. All welded duct collar(s). Provide with stainless steel compartment at end of hood for housing Fire Suppression System, if shown on drawings.
10. Hood shall be provided with hood mounted temperature sensor and control panel designed and installed to automatically activate the exhaust fan whenever cooking operation occurs. The activation of the exhaust fan shall occur through and interlock with the cooking appliances, by means of heat sensor, per IMC 2006 507.2.1.1 requirements.
11. Hood shall provide provisions for the Halton Safeguard system including M.A.R.V.E.L. demand control system, AirWatch IEQ sensor, and Fire Watch early fire warning system. System shall include Halton Infrared Radiation Index Sensors (IRIS). Temp only systems shall not be allowed. System provided with model ABD automated balancing dampers to modulate airflow at each individual hood section. System shall be provided with BACnet gateway for direct communication to BMS and control panel with touchscreen for user interface. (1) control panel shall be provided for hood. System provided with Halton model KGS grease sensing system to monitor grease build-up in exhaust ductwork, signaling the operator when grease accumulation in ductwork exceeds NFPA cleaning required levels.
12. Provide and install Halton Patent Pending LED light fixture with the following certifications U.L., CSA, NSF and CE for use in grease exhaust hoods in quantity sufficient to provide 50 foot candles at the 36" A.F.F. cooking surface when hood is mounted 84" A.F.F. Halton LED light fixture is complete with die cast aluminum junction box with integral fins for natural heat dissipation. Input voltage of 24VDC with a power consumption not to exceed . The housing encases 24 LED light emitters with a brightness of 1000 lumens. Lighting color shall be cool white (fluorescent). Lamp body is stainless steel ring with a high temperature silicone seal. Junction box to accept standard ½" NPT fitting. Fixture shall come complete with integral power supply with an input voltage of 108VAC 305VAC and input frequency of 50/60 Hz. Input current rating shall be @ 120VAC. Fixture shall contain no mercury or lead.

13. This hood is to be integrated into a MARVEL system. It is the intent of this specification that the exhaust hood, fire suppression system, and supply air plenum, Automatic Balancing Dampers (ABD), and MARVEL control panel are to be provided and installed by the Kitchen Equipment Contractor. The VFD's are to be located, supplied and installed by the Mechanical Contractor.
14. Switch Panel to include Hood ON/OFF Light Switch and Fan ON/OFF Switch. Switch Panel to be Remote Mounted.
15. Kitchen Equipment Contractor (K.E.C.) shall provide fire wrap insulation on top of the hood if required by local code authority.
16. Provide with KCD supply air diffusers as shown on hood detail drawings.

ITEM #B56.3 EXHAUST HOOD

Quantity: One (1)
Manufacturer: Halton Company
Model: KVM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Halton KVM Filter Type Exhaust Hood with Capture Jet™ 2nd generation system.
2. Provide per fabricator's detail drawings in QF-700 sheet series. Halton drawing number reference U24-599.
3. The canopy shall bear UL or ETL labels and be listed as “range hood without exhaust fire damper” per standard 710 and be fabricated in compliance with NFPA-96 and shall bear the National Sanitation Foundation seal of approval.
4. The canopy inner liner shall be 100% 18-gauge stainless steel, type 304 with #4 finish. Each canopy shall have a filter housing of the same material as the canopy liner. The filter housing shall be equipped with a concealed drip tray the full length of the canopy and with a grease cup for easy removal and daily cleaning.
5. The exhaust airflow will be based on the convective heat generated by the appliances underneath each canopy. Submittal shall include convective heat calculations based on the input power of the appliance served and efficiency of hood system consistent with results of independent test based on ASTM Standards F-1704-05 Capture & Containment and F-2474-05 Heat Gain to Space.
6. Final air volume calculations shall comply with the hood listing. The use of end panels or rear seals to achieve required airflows are not acceptable. Use of Capture Walls to create a seal between cooking equipment and wall shall not be used as they require cooking equipment to be located further from wall reducing isle space
7. The Capture Jet air shall be introduced through a special discharge panel and shall not exceed 15% of the calculated exhaust airflow. The Capture Jet discharge velocity will be a minimum of 1500 FPM. Slot type discharge shall not be used. The Capture Jet air increases the capture efficiency of the smoke and contaminated air at both the face and sides of the hood. The Capture Jet chamber is to be fully insulated.
8. Provide hood pre piped for Fire Suppression System. Final connections to hood duct collar(s) by the Mechanical Division. Hood construction and components to be UL and NSF listed. Provide hood mounted switch panel for fan and lights. Mounting height of bottom edge of hood to be 6'-8" above finished floor. Verify and coordinate all dimensions, and duct requirements and locations with site and Mechanical Division. See ventilation drawing sheet for general size and location of duct(s). If not installed against the finished ceiling, provide matching stainless steel closure panels above hood to finished ceiling, to conceal duct(s) and hood fire suppression system piping; verify height.
9. The hood shall be equipped with model KSA multi-cyclone stainless steel grease extractors. Filters shall be rated at 93%-98% extraction efficiency on particulates in the 5-10-micron range based on ASTM Standard F-2519-05. The pressure loss over the extractor shall not exceed 0.50"

of water at flow rates approved by UL for heavy load cooking. Sound levels shall not exceed an NC rating of 55. Baffle or slot type extractors shall not be used. The hood shall be supplied with a control panel on the face of the hood consisting of: Exhaust Fan Switch with pilot light. Light Switch with pilot light. Hangers, supports and miscellaneous accessories as required for installation. The installation shall be in accordance with the manufacturer's recommendations and conform to NFPA-96 guidelines and all applicable local codes. Air space at wall(s) to accommodate requirements of the latest edition of NFPA 96 clearance to combustibles. All welded duct collar(s). Provide with stainless steel compartment at end of hood for housing Fire Suppression System, if shown on drawings.

10. Hood shall be provided with hood mounted temperature sensor and control panel designed and installed to automatically activate the exhaust fan whenever cooking operation occurs. The activation of the exhaust fan shall occur through and interlock with the cooking appliances, by means of heat sensor, per IMC 2006 507.2.1.1 requirements.
11. Hood shall provide provisions for the Halton Safeguard system including M.A.R.V.E.L. demand control system, AirWatch IEQ sensor, and Fire Watch early fire warning system. System shall include Halton Infrared Radiation Index Sensors (IRIS). Temp only systems shall not be allowed. System provided with model ABD automated balancing dampers to modulate airflow at each individual hood section. System shall be provided with BACnet gateway for direct communication to BMS and control panel with touchscreen for user interface. (1) control panel shall be provided for hood. System provided with Halton model KGS grease sensing system to monitor grease build-up in exhaust ductwork, signaling the operator when grease accumulation in ductwork exceeds NFPA cleaning required levels.
12. Provide and install Halton Patent Pending LED light fixture with the following certifications U.L., CSA, NSF and CE for use in grease exhaust hoods in quantity sufficient to provide 50 foot candles at the 36" A.F.F. cooking surface when hood is mounted 84" A.F.F. Halton LED light fixture is complete with die cast aluminum junction box with integral fins for natural heat dissipation. Input voltage of 24VDC with a power consumption not to exceed . The housing encases 24 LED light emitters with a brightness of 1000 lumens. Lighting color shall be cool white (fluorescent). Lamp body is stainless steel ring with a high temperature silicone seal. Junction box to accept standard ½" NPT fitting. Fixture shall come complete with integral power supply with an input voltage of 108VAC 305VAC and input frequency of 50/60 Hz. Input current rating shall be @ 120VAC. Fixture shall contain no mercury or lead.
13. This hood is to be integrated into a MARVEL system. It is the intent of this specification that the exhaust hood, fire suppression system, and supply air plenum, Automatic Balancing Dampers (ABD), and MARVEL control panel are to be provided and installed by the Kitchen Equipment Contractor. The VFD's are to be located, supplied and installed by the Mechanical Contractor.
14. Switch Panel to include Hood ON/OFF Light Switch and Fan ON/OFF Switch. Switch Panel to be Remote Mounted.
15. Kitchen Equipment Contractor (K.E.C.) shall provide fire wrap insulation on top of the hood if required by local code authority.
16. Provide with KCD supply air diffusers as shown on hood detail drawings.

ITEM #B56.4 EXHAUST HOOD

Quantity: One (1)
Manufacturer: Halton Company
Model: KVM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Halton KVM Filter Type Exhaust Hood with Capture Jet™ 2nd generation system.

2. Provide per fabricator's detail drawings in QF-700 sheet series. Halton drawing number reference U24-599.
3. The canopy shall bear UL or ETL labels and be listed as “range hood without exhaust fire damper” per standard 710 and be fabricated in compliance with NFPA-96 and shall bear the National Sanitation Foundation seal of approval.
4. The canopy inner liner shall be 100% 18-gauge stainless steel, type 304 with #4 finish. Each canopy shall have a filter housing of the same material as the canopy liner. The filter housing shall be equipped with a concealed drip tray the full length of the canopy and with a grease cup for easy removal and daily cleaning.
5. The exhaust airflow will be based on the convective heat generated by the appliances underneath each canopy. Submittal shall include convective heat calculations based on the input power of the appliance served and efficiency of hood system consistent with results of independent test based on ASTM Standards F-1704-05 Capture & Containment and F-2474-05 Heat Gain to Space.
6. Final air volume calculations shall comply with the hood listing. The use of end panels or rear seals to achieve required airflows are not acceptable. Use of Capture Walls to create a seal between cooking equipment and wall shall not be used as they require cooking equipment to be located further from wall reducing isle space
7. The Capture Jet air shall be introduced through a special discharge panel and shall not exceed 15% of the calculated exhaust airflow. The Capture Jet discharge velocity will be a minimum of 1500 FPM. Slot type discharge shall not be used. The Capture Jet air increases the capture efficiency of the smoke and contaminated air at both the face and sides of the hood. The Capture Jet chamber is to be fully insulated.
8. Provide hood pre piped for Fire Suppression System. Final connections to hood duct collar(s) by the Mechanical Division. Hood construction and components to be UL and NSF listed. Provide hood mounted switch panel for fan and lights. Mounting height of bottom edge of hood to be 6'-8" above finished floor. Verify and coordinate all dimensions, and duct requirements and locations with site and Mechanical Division. See ventilation drawing sheet for general size and location of duct(s). If not installed against the finished ceiling, provide matching stainless steel closure panels above hood to finished ceiling, to conceal duct(s) and hood fire suppression system piping; verify height.
9. The hood shall be equipped with model KSA multi-cyclone stainless steel grease extractors. Filters shall be rated at 93%-98% extraction efficiency on particulates in the 5-10-micron range based on ASTM Standard F-2519-05. The pressure loss over the extractor shall not exceed 0.50" of water at flow rates approved by UL for heavy load cooking. Sound levels shall not exceed an NC rating of 55. Baffle or slot type extractors shall not be used. The hood shall be supplied with a control panel on the face of the hood consisting of: Exhaust Fan Switch with pilot light. Light Switch with pilot light. Hangers, supports and miscellaneous accessories as required for installation. The installation shall be in accordance with the manufacturer's recommendations and conform to NFPA-96 guidelines and all applicable local codes. Air space at wall(s) to accommodate requirements of the latest edition of NFPA 96 clearance to combustibles. All welded duct collar(s). Provide with stainless steel compartment at end of hood for housing Fire Suppression System, if shown on drawings.
10. Hood shall be provided with hood mounted temperature sensor and control panel designed and installed to automatically activate the exhaust fan whenever cooking operation occurs. The activation of the exhaust fan shall occur through and interlock with the cooking appliances, by means of heat sensor, per IMC 2006 507.2.1.1 requirements.
11. Hood shall provide provisions for the Halton Safeguard system including M.A.R.V.E.L. demand control system, AirWatch IEQ sensor, and Fire Watch early fire warning system. System shall include Halton Infrared Radiation Index Sensors (IRIS). Temp only systems shall not be allowed. System provided with model ABD automated balancing dampers to modulate airflow at each individual hood section. System shall be provided with BACnet gateway for direct communication to BMS and control panel with touchscreen for user interface. (1) control panel shall be provided for hood. System provided with Halton model KGS grease sensing system to monitor grease

build-up in exhaust ductwork, signaling the operator when grease accumulation in ductwork exceeds NFPA cleaning required levels.

12. Provide and install Halton Patent Pending LED light fixture with the following certifications U.L., CSA, NSF and CE for use in grease exhaust hoods in quantity sufficient to provide 50 foot candles at the 36" A.F.F. cooking surface when hood is mounted 84" A.F.F. Halton LED light fixture is complete with die cast aluminum junction box with integral fins for natural heat dissipation. Input voltage of 24VDC with a power consumption not to exceed . The housing encases 24 LED light emitters with a brightness of 1000 lumens. Lighting color shall be cool white (fluorescent). Lamp body is stainless steel ring with a high temperature silicone seal. Junction box to accept standard ½" NPT fitting. Fixture shall come complete with integral power supply with an input voltage of 108VAC 305VAC and input frequency of 50/60 Hz. Input current rating shall be @ 120VAC. Fixture shall contain no mercury or lead.
13. This hood is to be integrated into a MARVEL system. It is the intent of this specification that the exhaust hood, fire suppression system, and supply air plenum, Automatic Balancing Dampers (ABD), and MARVEL control panel are to be provided and installed by the Kitchen Equipment Contractor. The VFD's are to be located, supplied and installed by the Mechanical Contractor.
14. Switch Panel to include Hood ON/OFF Light Switch and Fan ON/OFF Switch. Switch Panel to be Remote Mounted.
15. Kitchen Equipment Contractor (K.E.C.) shall provide fire wrap insulation on top of the hood if required by local code authority.
16. Provide with KCD supply air diffusers as shown on hood detail drawings.

ITEM #B56.5 HOOD CONTROL CABINET

Quantity: One (1)
Manufacturer: Halton Company
Model: M.A.R.V.E.L.

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Wall mounted cabinet to control M.A.R.V.E.L. intelligent demand controlled ventilation system.
2. Controls for exhaust hoods items B56.1, B56.2, B56.3, B56.4
3. Provide per fabricator's detail drawings in QF-700 sheet series. Halton drawing number reference U24-599
4. Inter-wiring by E.C. and Low-Voltage Contractor.

ITEM #B57.1 FIRE SUPPRESSION SYSTEM

Quantity: One (1)
Manufacturer: Ansul Fire Protection
Model: ANSUL R-102

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Ansul R 102 Ansulex Liquid Fire Suppressant. Surface appliance nozzles, hood and duct protection nozzles in Exhaust Hood Item B56.1,B56.2,
2. Provide per fabricator's detail drawings in QF-700 sheet series. Halton drawing number reference U24-599 .
3. Manual pull station and micro switches with two sets of normally open and two sets of normally closed contact points. All exposed pipe and fittings to be chrome plated or stainless steel. All components and labor necessary for completely installed system in accordance with

manufacturer's listings and instructions, U.L. Standard 300, UL Standard 1254, NFPA NFPA-96, and all applicable local codes, standards, and regulations. Components inside exhaust hood to be installed at hood manufacturer's shop. The system shall include factory prepipe, all permits, and test as required by the authority having jurisdiction.

4. Components inside exhaust hood to be installed at hood manufacturer's shop during fabrication. Coordinate size(s) and installation with Plumbing Division. Six month and twelve month inspections, servicing, and replacement of components as per N.F.P.A. 96. Electrical Division to provide shunt trip breakers at main power panel, or disconnects, as designated by the Electrical Engineer; interconnected with micro switch at fire system control panel, for all electricity in and under exhaust hood. Shunt trips/disconnects to accomplish shut off of electricity in event of fire system activation. Ansul to provide complete shop drawings, locate and/or verify and coordinate system tank(s), panel(s), and pull station(s) location(s) and requirements, and verify and coordinate with Mechanical Engineer's documents and Division 15's exhaust and supply air requirements for hood(s); for proper protection of hood(s) and equipment in and below the hood(s), controlling of associated components, and interconnection of multiple fire systems as required. Provision and installation of components and system(s) to be by dealer and installer authorized, factory trained, and certified to sell, install, and service Ansul fire suppression system(s) as noted in this specification, at the time of bidding, installation, start-up, and warranty period of this project. Six month and twelve-month inspections, servicing, and replacement of components as per N.F.P.A. 96. Electrical Division provide shunt trip breakers at main power panel, or disconnects, as designated by the Electrical Engineer; interconnected with micro switch at fire system control panel, for all electricity in and under exhaust hood. Shunt trips/disconnects to accomplish shut off of electricity in event of fire system activation.
4. Ansul to provide complete shop drawings, locate and/or verify and coordinate system tank(s), panel(s), and pull station(s) location(s) and requirements, and verify and coordinate with Mechanical Engineer's documents and Division 15's exhaust and supply air requirements for hood(s); for proper protection of hood(s) and equipment in and below the hood(s), controlling of associated components, and interconnection of multiple fire systems as required. Provision and installation of components and system(s) to be by dealer and installer authorized, factory trained, and certified to sell, install, and service Ansul fire suppression system(s) as noted in this specification, at the time of bidding, installation, start-up, and warranty period of this project.
5. As part of this item, provide wall mounted type K Ansul hand held portable fire extinguisher, placard, and mounting bracket as required in the immediate vicinity of each cooking area, per NFPA-96 and NFPA-10. Additional fire extinguishers as required in the kitchen area are to be specified by the Architect and provided by the General Contractor.
6. EC to wire wall mounted reset button and control panel mounted in fire suppression bottle cabinet. Mount reset button at 48" AFF where shown on drawings.

ITEM #B57.2 FIRE SUPPRESSION SYSTEM

Quantity: One (1)
Manufacturer: Ansul Fire Protection
Model: ANSUL R-102

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Ansul R 102 Ansulex Liquid Fire Suppressant. Surface appliance nozzles, hood and duct protection nozzles in Exhaust Hood Item B56.3, B56.4

2. Provide per fabricator's detail drawings in QF-700 sheet series. Halton drawing number reference U24-599 .
3. Manual pull station and micro switches with two sets of normally open and two sets of normally closed contact points. All exposed pipe and fittings to be chrome plated or stainless steel. All components and labor necessary for completely installed system in accordance with manufacturer’s listings and instructions, U.L. Standard 300, UL Standard 1254, NFPA NFPA-96, and all applicable local codes, standards, and regulations. Components inside exhaust hood to be installed at hood manufacturer's shop. The system shall include factory prepipe, all permits, and test as required by the authority having jurisdiction.
4. Components inside exhaust hood to be installed at hood manufacturer's shop during fabrication. Coordinate size(s) and installation with Plumbing Division. Six month and twelve month inspections, servicing, and replacement of components as per N.F.P.A. 96. Electrical Division to provide shunt trip breakers at main power panel, or disconnects, as designated by the Electrical Engineer; interconnected with micro switch at fire system control panel, for all electricity in and under exhaust hood. Shunt trips/disconnects to accomplish shut off of electricity in event of fire system activation. Ansul to provide complete shop drawings, locate and/or verify and coordinate system tank(s), panel(s), and pull station(s) location(s) and requirements, and verify and coordinate with Mechanical Engineer's documents and Division 15's exhaust and supply air requirements for hood(s); for proper protection of hood(s) and equipment in and below the hood(s), controlling of associated components, and interconnection of multiple fire systems as required. Provision and installation of components and system(s) to be by dealer and installer authorized, factory trained, and certified to sell, install, and service Ansul fire suppression system(s) as noted in this specification, at the time of bidding, installation, start-up, and warranty period of this project. Six month and twelve-month inspections, servicing, and replacement of components as per N.F.P.A. 96. Electrical Division provide shunt trip breakers at main power panel, or disconnects, as designated by the Electrical Engineer; interconnected with micro switch at fire system control panel, for all electricity in and under exhaust hood. Shunt trips/disconnects to accomplish shut off of electricity in event of fire system activation.
4. Ansul to provide complete shop drawings, locate and/or verify and coordinate system tank(s), panel(s), and pull station(s) location(s) and requirements, and verify and coordinate with Mechanical Engineer's documents and Division 15's exhaust and supply air requirements for hood(s); for proper protection of hood(s) and equipment in and below the hood(s), controlling of associated components, and interconnection of multiple fire systems as required. Provision and installation of components and system(s) to be by dealer and installer authorized, factory trained, and certified to sell, install, and service Ansul fire suppression system(s) as noted in this specification, at the time of bidding, installation, start-up, and warranty period of this project.
5. As part of this item, provide wall mounted type K Ansul hand held portable fire extinguisher, placard, and mounting bracket as required in the immediate vicinity of each cooking area, per NFPA-96 and NFPA-10. Additional fire extinguishers as required in the kitchen area are to be specified by the Architect and provided by the General Contractor.
6. EC to wire wall mounted reset button and control panel mounted in fire suppression bottle cabinet. Mount reset button at 48" AFF where shown on drawings.

ITEM #B58 WALL FLASHING

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Similar to standard detail FSD1-39. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
2. Provide 20-gauge stainless steel panels from top of coved tile base to ceiling.

ITEM #B94 WORK TABLE, MOBILE

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Work table, see plans for width, length, height, and configuration.
2. Standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions. Similar to standard details FSD1-7 and FSD1-10.
3. Island work table with undershelf, similar to detail FSD2-6.
4. 5" Heavy-duty casters, two (2) with brakes.
5. Straight turn-down edge profile similar to detail FSD1-1A.
6. Undershelf, similar to detail FSD2-6.

ITEM #B60 FRYER BATTERY, ELECTRIC

Quantity: One (1)
Manufacturer: Pitco Frialator (Middleby)
Model: SE14RS-2FD

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Solstice™ Prepackaged Fryer System with Solstice™ Filter Drawer System, High Power, electric, (2) 50 lb. oil capacity full tanks, solid state controls, boil out, drain valve interlock, melt cycle, stainless steel tank, front & sides, under-fryer drawer filtration, total (-FF), ENERGY STAR®, cULus, NSF, CE, GS
2. NOTE: Power supply for basket lifts and filter motor is hard wired at the factory for 208v, 240v models
3. Solid State Thermostat, standard
4. Basket, (2) oblong/twin size, 13-1/2" x 6-1/2" x 5-3/4" deep, long handle, regular mesh (shipped std (n/c) with models "T" SG14, SG14R, SSH55, SE14, SE14X, SE14B, SG14T, 35+, 45+, fryer batteries shipped with (1) per fryer
6. 9" legs, standard

ITEM #B61 GRIDDLE, ELECTRIC, COUNTERTOP

Quantity: One (1)
Manufacturer: Lang Manufacturing (Middleby)
Model: 136S

Fabricate/Furnish and set-in place per plans, details, and the following:

1. LG Heavy Duty Griddle, electric, countertop, 36" W x 22.9" D cooking surface, 1" thick polished steel griddle plate, Selectronic™ solid state control every 12", temperature range 175° - 450°F welded steel frame with stainless steel exterior, 5" tapered wrap-around splash guard, 8qt grease drawer, stainless steel legs, NSF, cETLus, Made in USA

ITEM #B61.1 EQUIPMENT STAND, REFRIGERATED BASE

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: D36GN

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Refrigerator Griddle Stand, one-section, (2) drawers, accommodates (1) 12" x 20" x 6", stainless steel top with drip guard marine edge, stainless steel exterior & interior, electronic control with digital display, hi-low alarm, high/low temperature alarm, self-contained refrigeration, R290 hydrocarbon refrigerant,10' cord, cETLus, NSF, ENERGY STAR®
2. Condensing unit on the right, standard
3. Casters, 3" diameter, 4"H overall, standard

ITEM #B62 INDUCTION RANGE, FLOOR MODEL

Quantity: Two (2)
Manufacturer: Lang Manufacturing (Middleby)
Model: RI36C-ATE

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Induction Range, electric, floor model, 36"W, (6) 8" glass induction hobs, convection oven base with (6) rack positions and (3) racks, 150°-450°F solid state oven thermostat with 1-hour timer, 2" vented stainless steel stub back, 430 stainless steel exterior, 6" adjustable legs, cULus, NSF

ITEM #B63 COOK HOLD OVEN CABINET SMOKER, ELECTRIC

Quantity: One (1)
Manufacturer: Alto-Shaam
Model: 1000-SK/I

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Halo Heat® Slo Cook and Smoker Oven, electric, low-temperature, double-deck, standard depth, 120 lb. capacity each - (1) rib rack shelf per compartment, (3) full-size pans, simple controls, (2) stainless steel wire shelves per compartment, (1) exterior drip tray, includes (1) sample bag each

of cherry, hickory, apple & maple wood chips, heavy-duty stainless steel, 5" casters; 2 rigid, 2 swivel with brakes, EcoSmart®, cULus, NSF, CE, IPX4, TUV NORD
2. No cord or plug
3. Solid Door, hinged on right, standard
4. Stainless steel exterior, standard

ITEM #B64 TILTING SKILLET BRAISING PAN, ELECTRIC

Quantity: One (1)
Manufacturer: Crown (Middleby)
Model: EMTS-60

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Tilting Skillet, electric, 60 gallon capacity, electric hydraulic lift, spring assisted cover, removable pour strainer, temperature light, tilt switch, high limit thermostat, 304 stainless steel construction, cabinet base, 6" legs with adjustable flanged feet, 1/2 HP, cCSAus, NSF
2. Etched markings, gallon, standard
3. 480V/3PH/60Hz

ITEM #B65 FLOOR TROUGH & GRATE

Quantity: One (1)
Manufacturer: Eagle Group
Model: ASFT-2436-SG

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Anti-Splash Floor Trough, 36"W x 24"D, stainless steel subway-style grating, 6" deep trough pan with built-in pitch toward drain, accommodates up to a 4" diameter drain pipe, stainless steel removable perforated basket, all-welded 14/304 stainless steel construction, NSF

ITEM #B66 KETTLE, ELECTRIC, TILTING

Quantity: One (1)
Manufacturer: Groen
Model: DEE-60C2T

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Tilting Kettle, electric, 60-gallon capacity, 2/3 jacket, IPX6 water rated electronic Cook2Temp™ controls with core probe, auto and manual cook settings, 316 stainless steel liner, crank tilt, floor mounted control console, stainless steel construction, bullet feet, 50 PSI, cULus, NSF, Made in USA

ITEM #B67 FLOOR TROUGH & GRATE

Quantity: One (1)
Manufacturer: Eagle Group

Model: ASFT-2436-SG

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Anti-Splash Floor Trough, 36"W x 24"D, stainless steel subway-style grating, 6" deep trough pan with built-in pitch toward drain, accommodates up to a 4" diameter drain pipe, stainless steel removable perforated basket, all-welded 14/304 stainless steel construction, NSF

ITEM #B68 KETTLE, ELECTRIC, TILTING

Quantity: One (1)
Manufacturer: Groen
Model: DEE-40C2T

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Tilting Kettle, electric, 40-gallon capacity, 2/3 jacket, IPX6 water rated electronic Cook2Temp™ controls with core probe, auto and manual cook settings, 316 stainless steel liner, crank tilt, floor mounted control console, stainless steel construction, bullet feet, 50 PSI, cULus, NSF, Made in USA

ITEM #B69 FLOOR TROUGH & GRATE

Quantity: One (1)
Manufacturer: Eagle Group
Model: ASFT-2436-SG

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Anti-Splash Floor Trough, 36"W x 24"D, stainless steel subway-style grating, 6" deep trough pan with built-in pitch toward drain, accommodates up to a 4" diameter drain pipe, stainless steel removable perforated basket, all-welded 14/304 stainless steel construction, NSF

ITEM #B70 COMBI OVEN, ELECTRIC

Quantity: One (1)
Manufacturer: Alto-Shaam
Model: 7-20E CLASSIC

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Stacked Configuration, Prodigi™ Classic Combi Oven/Steamer, electric, boiler-free, countertop, (7) 18" x 26" full size sheet or (16) 12" x 20" full size hotel pan (GN 1/1) capacity, programmable, touch-screen control with steam/convection/combi cooking modes, SafeVent™ steam venting, (5) cleaning levels, door hinged right, high efficiency LED lighting, (2) side racks with (8) non-tilt support rails, stainless steel construction, adjustable stainless steel legs, EcoSmart®, cULus, UL EPH Classified, CE, IPX5, EAC.
2. No cord or plug

ITEM #B70.1 COMBI OVEN, ELECTRIC

Quantity: One (1)
Manufacturer: Alto-Shaam
Model: 10-20E CLASSIC

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Stacked Configuration, Prodigi™ Classic Combi Oven/Steamer, electric, boiler-free, countertop, (10) 18" x 26" full size sheet or (22) 12" x 20" full size hotel pan (GN 1/1) capacity, (2) side racks with (11) non-tilt support rails, programmable, touch-screen control with steam/convection/combi cooking modes, SafeVent™ steam venting, (5) cleaning levels, door hinged right, high efficiency LED lighting, stainless steel construction, adjustable stainless steel legs, EcoSmart®, cULus, UL EPH Classified, CE, IPX5, EAC
2. No cord or plug

ITEM #B70.2 WATER FILTRATION SYSTEM, PARTS & ACCESSORIES

Quantity: One (1)
Manufacturer: Everpure
Model: EV929322

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Coldrink/Insurice Water Filtration Manifold, Coldrink/Insurice Twin, (1) EC210 prefilter, (1) Coldrink/Insurice Twin Manifold, mounting bracket, built-in water shut-off valve, outlet pressure gauge, 3/4" inlet, 3/4" outlet (EV929322)

ITEM #B71 FLOOR TROUGH

Quantity: One (1)
Manufacturer: IMC/Teddy
Model: TRE-36-SQ

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Trench Drain System, 36"W x 4"D, 4" deep receptacle, (1) 2" OD drain, perforated waste strainer, 14/304 stainless steel, brushed satin finish, (SQ) grid grating, NSF, Made in USA

ITEM #B72 COMBI OVEN, ELECTRIC

Quantity: One (1)
Manufacturer: Alto-Shaam
Model: 7-20E CLASSIC

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Stacked Configuration, Prodigi™ Classic Combi Oven/Steamer, electric, boiler-free, countertop, (7) 18" x 26" full size sheet or (16) 12" x 20" full size hotel pan (GN 1/1) capacity, programmable, touch-screen control with steam/convection/combi cooking modes, SafeVent™ steam venting, (5)

cleaning levels, door hinged right, high efficiency LED lighting, (2) side racks with (8) non-tilt support rails, stainless steel construction, adjustable stainless steel legs, EcoSmart®, cULus, UL EPH Classified, CE, IPX5, EAC, city-wide COA for New York City

2. No cord or plug

ITEM #B72.1 COMBI OVEN, ELECTRIC

Quantity: One (1)
Manufacturer: Alto-Shaam
Model: 10-20E CLASSIC

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Stacked Configuration, Prodigi™ Classic Combi Oven/Steamer, electric, boiler-free, countertop, (10) 18" x 26" full size sheet or (22) 12" x 20" full size hotel pan (GN 1/1) capacity, (2) side racks with (11) non-tilt support rails, programmable, touch-screen control with steam/convection/combi cooking modes, SafeVent™ steam venting, (5) cleaning levels, door hinged right, high efficiency LED lighting, stainless steel construction, adjustable stainless steel legs, EcoSmart®, cULus, UL EPH Classified, CE, IPX5, EAC, city-wide COA for New York City
2. No cord or plug

ITEM #B73 FLOOR TROUGH

Quantity: One (1)
Manufacturer: IMC/Teddy
Model: TRE-36-SQ

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Trench Drain System, 36"W x 4"D, 4" deep receptacle, (1) 2" OD drain, perforated waste strainer, 14/304 stainless steel, brushed satin finish, (SQ) grid grating, NSF, Made in USA

ITEM #B74 BLAST CHILLER FREEZER, REACH-IN

Quantity: One (1)
Manufacturer: Irinox North America
Model: EASYFRESH NEXT LL

Fabricate/Furnish and set-in place per plans, details, and the following:

1. EasyFresh® NEXT LL Blast Chiller/Shock Freezer, reach-in: capacity - (14) 18" x 26" sheet pans, (28) 12" x 20" x 2.5" steam table pans (Table & Sheet Pans NOT included) Rapid Blast Chill capacty yield of 110 lbs. from finished cooked temperature 194°F to 37°F in approximately 90 minutes & Rapid Shock Freeze capacity yield of 99 lbs. from finished cooked temperature 194°F to 0°F in approximately 4 hours. Tests carried out in compliance with IRINOX procedures using 2" thick food products. USB HACCP data transfer, automatic cold/frozen holding, door hinged left (Standard), touch pad controls, (4) standard modes for chilling & freezing, temperature probe, automatic SANIGEN® sanitation system, self-contained air-cooled condensing unit, (6) stainless steel wire shelves, stainless steel adjustable legs, 304 stainless steel internal and external

material, 2 1/2 HP compressor rating, Unit comes with cord no plug, suggested plug is a NEMA. RcULus, UL EPH Classified (compliant with NSF standards)

ITEM #B75 SPARE NO.

ITEM #B76 SPARE NO.

ITEM #B77 SPARE NO.

ITEM #B78 SPARE NO.

ITEM #B79 WALK-IN COOLER

Quantity: One (1)
Manufacturer: American Panel
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. See plans for size and configuration. Walk-in cooler or freezer to be prefabricated of modular design and construction. Walk-in boxes to be installed by an American Panel - approved installation team.
2. Refer to manufacturer's drawings in QF-700 sheet series for further information.
3. All walk-in panels shall be provided with an overall thickness of 4" (100mm).
4. Floor to be set onto existing floor prepared by the G.C. defined in manufacturer's drawings and in foodservice plans. Provide interior ramp where shown on drawings. Provide with Amerituff structural floor with 1/8" integral diamond aluminum tread plate with 3/4" plywood underlayment and fiberglass grating support.
5. Panels shall consist of interior and exterior metal skins precisely formed with steel dies as fabricated on metal folding machines and thoroughly checked with gauges for accuracy. The insulation shall be "Foamed-In Place" (not laminated) and when completely heat-cured, bind tenaciously to the metal skins to form a rigid 4" (104mm) thick insulated panel. Urethane shall be CFC free high pressure impingement mixed, not poured or frothed. To ensure tight joints, panel edges must have foamed-in-place tongues and grooves which are of the same density as the rest of the panel. A flexible vinyl gasket, which is also foamed in place (not glued or stapled) shall extend around the interior and exterior perimeter of all tongue edges. Gaskets shall be resistant to damage from oil, fats, water and detergents and must be NSF-approved. Foam core of panels shall be Underwriters Laboratories-listed as having flame spread of 20 or lower and smoke generation of 350 or lower when tested in accordance with ASTME-84-76 and certified with a UL Label. Panels shall be approved as a Class I building type. They shall be foamed using a high impingement mixing process utilizing Enovate™3000 or equal HFC expanding agents (zero ozone depleting). Panels shall comply with the Federal Energy Independence and Security Act of 2007 with minimum R-values tested per the code of R25 for 4" cooler panels and R32 for 4" Freezer panels. All panels except corner panels shall be made in 23" and 46" widths, fully interchangeable for fast, easy assembly. Panels 11-1/2", 17-1/4" or 34-1/2" wide are to be furnished only if required to fit the allocated space. Custom width panels shall be provided to

meet non-nominal sizes. To assure perfect alignment and maximum strength, corner panels shall employ a right-angle configuration with exterior horizontal dimensions of 12” on each side. Vertical panels (except corner panels) shall be supplied in a single length up to 28’ high (16’ high for installations with aluminum or stainless-steel finish). Panels shall be equipped with diaphragmatic joining devices. The distance between locks shall not exceed 46”. Each device shall consist of a cam action, hooked locking arm placed in one panel, and a steel rod positioned in the adjoining panel, so that when the arm is rotated, the hook engages the rod and draws the panels tightly together with cam action. Arms and rods shall be housed in individual steel pockets

6. Interior ceiling finish shall be .040" white smooth aluminum.
7. Interior walls shall be .040" white embossed aluminum. All interior walls to be finished with Boston Series 2000 grey in color rigid vinyl extruded bumper rail set at 18” and 60” AFF.
8. Exterior finish, where exposed shall be .032" white embossed aluminum. Balance of exterior finish un-exposed to be Stucco Acrylume. All exposed exterior walls and doors to be complete with 1/8” thick aluminum diamond tread plate to 36” AFF glued to walls and sealed with epoxy sealant topped with Boston Series 2000 grey in color rigid vinyl extruded bumper rail at top. Wainscot to begin at top of sanitary base. Provide heavy duty corner guards at exposed corners to 96” AFF where applicable.
9. Where swing doors are shown in plan, provide doors sized per plan and frame numbered per plan. Door to be hinged as shown on plan, complete with three hinges. The door to be flush type, constructed and insulated in the same manner as the wall panels, and finished inside and out, to match adjacent walls. Door to be complete with 1/8” thick aluminum diamond tread kick plate to 36” AFF inside and out. Door and door section to be further equipped with the following:
    a. Three (3) Kason 1277 strap hinges; one (1) Kason 27C polished chrome handle/locking deadbolt latch complete with a safety release to prevent entrapment of personnel within the box.
    b. Provide door section with an incandescent type vapor-proof light with clear globe and heavy-duty LED clear bulb, pilot light switch and conduit between switch box and receptacle box. All conduit and wiring to be concealed, where possible.
    c. Door to be complete with heavy-duty Kason Thermal Flex bi-parting vinyl strip door, heated viewport and LCN 4011 door closer . Door buck to be coordinated with finished floor elevation to allow minimum door sweep exposure at threshold interface. Threshold at door to be constructed of 10-gauge stainless steel tread plate 8” in depth to be secured in the center of the door threshold reaching 2” beyond the cooler wall face in and out. Threshold to be secured to floors with stainless steel countersunk fasteners.
    d. Kason 1825 heated pressure relief port (air-vent) for all door sections.
    e. IC+ Monitoring and alarm system shall incorporate an integrated light switch with automatic light off and 3-way & 4-way capability; temperature monitor and logger with high temperature and low temperature visual and audio alarm for Fahrenheit or Celsius temperature selection; integrated dry contact for alarm signaling (@24VAC, @30VDC); door and window heater control, HACCP preview via onboard LCD screen; HACCP download via USB; WIFI connectivity; battery backup; temperature alarm notification via email and/or email to SMS text messages when connected to facility local WIFI network; automatic and on-demand transmission of HACCP data via email; adaptive settings; door switch to enable door ajar alarm, door ajar notification via email and/or email to SMS text messages and automatic lights on when door opens; panic alarm with illuminated panic button, alarm buzzer with LED and notification via email and/or email to SMS text messages.
    f. Magnetic core gaskets on the top edge and both sides of the door shall keep the door in a closed position, forming a tight seal; a flexible, dual-blade wiper gasket shall be installed at the bottom of the door. NSF-approved gaskets shall be replaceable and resistant to damage from oil, fats, water and detergent.

g. Door shall have reinforcing type of frame around entire perimeter of the door opening to prevent racking or twisting and for hardware attachment. Reinforcing frame shall have thermal breaker.
h. Provide 14” x 14” viewport, heated frame and glass for 4” thick door.

10. Provide extra low temperature LED light fixtures with heavy duty tubes for field installation by the Electrical Division. All light fixtures to be U.L. listed for use inside walk-in cooler or freezer. All conduit and wiring between light fixtures to be concealed where possible. Refer to foodservice walk in electrical plan for number and location of light fixtures. Provide lighting inside walk-in to meet or exceed 10 foot-candles as measured at 12" above finish floor.
11. Fan Control Switch: Intermatic FF330M with electrical stub out through the ceiling panel above the door section to allow the electrical trades to provide a connection to the evaporator(s); operator can turn evaporators fan(s) off and they will resume automatically when this times out.
12. Matching finish trim strips, from floor to ceiling, at all exposed vertical edges, corners, and joints to building wall(s). Kitchen Equipment Contractor is responsible for verifying dimensions.
13. Matching finish closure panels from top of walk-in to finished ceiling, on exposed sides. Kitchen Equipment Contractor is responsible for verifying dimensions, and for providing access panels as necessary, verify with Architect.
14. Unit and all components to be N.S.F. Approved, U.L. and U.L. Classified with a flame spread of 20 or less and meet the requirements of N.S.F. Standard #7.
15. For any installation requiring additional ceiling support for equipment above or due to span length, provide self-supporting ceiling structural framework over the top of the walk-in compartment(s), and supported by the walk-in walls according to American Panel details.
16. Verify all dimensions with building conditions for proper fit. Provide maximum size possible to fit available space, using standard panels.
17. All penetrations to be sealed with approved expandable foam insulation and approved silicone sealant.
18. Provide required additional walk-in box ceiling support for any equipment planned to be mounted on top of box or required access by maintenance staff on box top.
19. Provide walk-In in compliance with Miami-Dade NOA requirements for outdoor walk-ins. Including all requirements regarding securing mechanisms, structural reinforcement, roofing, etc..

ITEM #B79.1 COOLER EVAPORATOR COIL - INCLUDED IN ITEM B115 COMPRESSOR RACK

Quantity: One (1)
Manufacturer: RDT
Model: IR1-1

Fabricate/Furnish and set-in place per plans, details, and the following:

1. The system shall be an "UL Listed" air-cooled package system for indoor installation. Pre-wired to main fused disconnect switch and pre-piped for single point connection. Flush mounted internal electrical panel. The condenser shall be multi circuited with aluminum fin copper tube and shall be designed for 10 degrees to 20degrees TD.

ITEM #B80 COOLER STORAGE SHELVING

Quantity: Four (4)
Manufacturer: Metro
Model: METROMAX (Q)

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Length, width and configuration per plan and verified walk in cooler dimensions.
2. MetroMax (Q) Open Grid Mat Shelving.
3. 86" High With Five Tiers.
4. Each section shall be free-standing with four legs.

ITEM #B81 WALK-IN FREEZER - INCLUDED IN ITEM B79

Quantity: One (1)
Manufacturer: American Panel
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Provide per details found in Item B79.

ITEM #B81.1 FREEZER EVAPORATOR COIL - INCLUDED IN ITEM B115 COMPRESSOR RACK

Quantity: One (1)
Manufacturer: RDT
Model: IR1-1

Fabricate/Furnish and set-in place per plans, details, and the following:

1. The system shall be an "UL Listed" air-cooled package system for indoor installation. Pre-wired to main fused disconnect switch and pre-piped for single point connection. Flush mounted internal electrical panel. The condenser shall be multi circuited with aluminum fin copper tube and shall be designed for 10 degrees to 20degrees TD.

ITEM #B82 FREEZER STORAGE SHELVING

Quantity: Four (4)
Manufacturer: Metro
Model: METROMAX (Q)

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Length, width and configuration per plan and verified walk in cooler dimensions.
2. MetroMax (Q) Open Grid Mat Shelving.
3. 86" High With Five Tiers.
4. Each section shall be free-standing with four legs.

ITEM #B83 SPARE NO.

ITEM #B84 SPARE NO.

ITEM #B85 WALK-IN COOLER - INCLUDED IN ITEM B79

Quantity: One (1)
Manufacturer: American Panel
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. See plans for size and configuration. Walk-in cooler or freezer to be prefabricated of modular design and construction. Walk-in boxes to be installed by an American Panel - approved installation team.
2. Refer to manufacturer's drawings in UB FS6 sheet series for further information.
3. All walk-in panels shall be provided with an overall thickness of 4" (100mm).
4. Floor to be set onto existing floor prepared by the G.C. defined in manufacturer's drawings and in foodservice plans. Provide with Amerituff structural floor with 1/8" integral diamond aluminum tread plate with 3/4" plywood underlayment and fiberglass grating support.
5. Panels shall consist of interior and exterior metal skins precisely formed with steel dies as fabricated on metal folding machines and thoroughly checked with gauges for accuracy. The insulation shall be "Foamed-In Place" (not laminated) and when completely heat-cured, bind tenaciously to the metal skins to form a rigid 4" (104mm) thick insulated panel. Urethane shall be CFC free high pressure impingement mixed, not poured or frothed. To ensure tight joints, panel edges must have foamed-in-place tongues and grooves which are of the same density as the rest of the panel. A flexible vinyl gasket, which is also foamed in place (not glued or stapled) shall extend around the interior and exterior perimeter of all tongue edges. Gaskets shall be resistant to damage from oil, fats, water and detergents and must be NSF-approved. Foam core of panels shall be Underwriters Laboratories-listed as having flame spread of 20 or lower and smoke generation of 350 or lower when tested in accordance with ASTME-84-76 and certified with a UL Label. Panels shall be approved as a Class I building type. They shall be foamed using a high impingement mixing process utilizing Enovate™3000 or equal HFC expanding agents (zero ozone depleting). Panels shall comply with the Federal Energy Independence and Security Act of 2007 with minimum R-values tested per the code of R25 for 4" cooler panels and R32 for 4" Freezer panels. All panels except corner panels shall be made in 23" and 46" widths, fully interchangeable for fast, easy assembly. Panels 11-1/2", 17-1/4" or 34-1/2" wide are to be furnished only if required to fit the allocated space. Custom width panels shall be provided to meet non-nominal sizes. To assure perfect alignment and maximum strength, corner panels shall employ a right-angle configuration with exterior horizontal dimensions of 12" on each side. Vertical panels (except corner panels) shall be supplied in a single length up to 28' high (16' high for installations with aluminum or stainless-steel finish). Panels shall be equipped with diaphragmatic joining devices. The distance between locks shall not exceed 46". Each device shall consist of a cam action, hooked locking arm placed in one panel, and a steel rod positioned in the adjoining panel, so that when the arm is rotated, the hook engages the rod and draws the panels tightly together with cam action. Arms and rods shall be housed in individual steel pockets
6. Interior ceiling finish shall be .040" white smooth aluminum.
7. Interior walls shall be .040" white embossed aluminum. All interior walls to be finished with Boston Series 2000 grey in color rigid vinyl extruded bumper rail set at 18" and 60" AFF.
8. Exterior finish, where exposed shall be .040" white embossed aluminum. Balance of exterior finish un-exposed to be Stucco Acrylume. All exposed exterior walls and doors to be complete with 1/8" thick aluminum diamond tread plate to 36" AFF glued to walls and sealed with epoxy sealant topped with Boston Series 2000 grey in color rigid vinyl extruded bumper rail at top. Wainscot to begin at top of sanitary base. Provide heavy duty corner guards at exposed corners to 96" AFF where applicable.
9. Where swing doors are shown in plan, provide doors sized per plan and frame numbered per plan. Door to be hinged as shown on plan, complete with three hinges. The door to be flush type, constructed and insulated in the same manner as the wall panels, and finished inside and out, to

match adjacent walls. Door to be complete with 1/8” thick aluminum diamond tread kick plate to 36” AFF inside and out. Door and door section to be further equipped with the following:

a. Three (3) Kason 1277 strap hinges; one (1) Kason 27C polished chrome handle/locking deadbolt latch complete with a safety release to prevent entrapment of personnel within the box.
b. Provide door section with an incandescent type vapor-proof light with clear globe and heavy-duty LED clear bulb, pilot light switch and conduit between switch box and receptacle box. All conduit and wiring to be concealed, where possible.
c. Door to be complete with heavy-duty Kason Thermal Flex bi-parting vinyl strip door, heated viewport and LCN 4011 door closer . Door buck to be coordinated with finished floor elevation to allow minimum door sweep exposure at threshold interface. Threshold at door to be constructed of 10-gauge stainless steel tread plate 8” in depth to be secured in the center of the door threshold reaching 2” beyond the cooler wall face in and out. Threshold to be secured to floors with stainless steel countersunk fasteners.
d. Kason 1825 heated pressure relief port (air-vent) for all door sections.
e. IC+ Monitoring and alarm system shall incorporate an integrated light switch with automatic light off and 3-way & 4-way capability; temperature monitor and logger with high temperature and low temperature visual and audio alarm for Fahrenheit or Celsius temperature selection; integrated dry contact for alarm signaling (@24VAC, @30VDC); door and window heater control, HACCP preview via onboard LCD screen; HACCP download via USB; WIFI connectivity; battery backup; temperature alarm notification via email and/or email to SMS text messages when connected to facility local WIFI network; automatic and on-demand transmission of HACCP data via email; adaptive settings; door switch to enable door ajar alarm, door ajar notification via email and/or email to SMS text messages and automatic lights on when door opens; panic alarm with illuminated panic button, alarm buzzer with LED and notification via email and/or email to SMS text messages.
f. Magnetic core gaskets on the top edge and both sides of the door shall keep the door in a closed position, forming a tight seal; a flexible, dual-blade wiper gasket shall be installed at the bottom of the door. NSF-approved gaskets shall be replaceable and resistant to damage from oil, fats, water and detergent.
g. Door shall have reinforcing type of frame around entire perimeter of the door opening to prevent racking or twisting and for hardware attachment. Reinforcing frame shall have thermal breaker.
h. Provide 14” x 14” viewport, heated frame and glass for 4” thick door.

10. Provide extra low temperature LED light fixtures with heavy duty tubes for field installation by the Electrical Division. All light fixtures to be U.L. listed for use inside walk-in cooler or freezer. All conduit and wiring between light fixtures to be concealed where possible. Refer to foodservice walk in electrical plan for number and location of light fixtures. Provide lighting inside walk-in to meet or exceed 10 foot-candles as measured at 12" above finish floor.
11. Fan Control Switch: Intermatic FF330M with electrical stub out through the ceiling panel above the door section to allow the electrical trades to provide a connection to the evaporator(s); operator can turn evaporators fan(s) off and they will resume automatically when this times out.
12. Matching finish trim strips, from floor to ceiling, at all exposed vertical edges, corners, and joints to building wall(s). Kitchen Equipment Contractor is responsible for verifying dimensions.
13. Matching finish closure panels from top of walk-in to finished ceiling, on exposed sides. Kitchen Equipment Contractor is responsible for verifying dimensions, and for providing access panels as necessary, verify with Architect.
14. Unit and all components to be N.S.F. Approved, U.L. and U.L. Classified with a flame spread of 20 or less and meet the requirements of N.S.F. Standard #7.
15. For any installation requiring additional ceiling support for equipment above or due to span length, provide self-supporting ceiling structural framework over the top of the walk-in compartment(s), and supported by the walk-in walls according to American Panel details.

16. Verify all dimensions with building conditions for proper fit. Provide maximum size possible to fit available space, using standard panels.
17. All penetrations to be sealed with approved expandable foam insulation and approved silicone sealant.
18. Provide required additional walk-in box ceiling support for any equipment planned to be mounted on top of box or required access by maintenance staff on box top.
19. Provide walk-In in compliance with Miami-Dade NOA requirements for outdoor walk-ins. Including all requirements regarding securing mechanisms, structural reinforcement, roofing, etc..

ITEM #B85.1 COOLER EVAPORATOR COIL - INCLUDED IN ITEM B115 COMPRESSOR RACK

Quantity: One (1)
Manufacturer: RDT
Model: IR1-1

Fabricate/Furnish and set-in place per plans, details, and the following:

1. The system shall be an "UL Listed" air-cooled package system for indoor installation. Pre-wired to main fused disconnect switch and pre-piped for single point connection. Flush mounted internal electrical panel. The condenser shall be multi circuited with aluminum fin copper tube and shall be designed for 10 degrees to 20degrees TD.

ITEM #B86 COOLER STORAGE SHELVING

Quantity: Six (6)
Manufacturer: Metro
Model: METROMAX (Q)

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Length, width and configuration per plan and verified walk in cooler dimensions.
2. MetroMax (Q) Open Grid Mat Shelving.
3. 86" High With Five Tiers.
4. Each section shall be free-standing with four legs.

ITEM #B87 BUN / SHEET PAN RACK

Quantity: Four (4)
Manufacturer: Cres Cor
Model: 2071812

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Utility Rack, mobile, angle ledge, full height, open sides, riveted pan slides with extruded angles, 5-1/8" centers, (24) 14" x 18" tray or (12) 18" x 26" pan capacity, end loading, fully welded Hi-Tensile aluminum frame construction, (4) 5" swivel casters (2) braked, NSF

ITEM #B88 SPARE NO.

ITEM #B89 SPARE NO.

ITEM #B90 SPARE NO.

ITEM #B91 BUN / SHEET PAN RACK

Quantity: Two (2)
Manufacturer: Cres Cor
Model: 2071812

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Utility Rack, mobile, angle ledge, full height, open sides, riveted pan slides with extruded angles, 5-1/8" centers, (24) 14" x 18" tray or (12) 18" x 26" pan capacity, end loading, fully welded Hi-Tensile aluminum frame construction, (4) 5" swivel casters (2) braked, NSF

ITEM #B92 TRASH RECEPTACLE, 23 GALLON; QTY: 1, N.I.K.E.C.- BY OWNER/OPERATOR

ITEM #B93 HAND SINK ASSEMBLY

Quantity: One (1)
Manufacturer: Eagle Group
Model: YHFL-5000-0013-00

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hand Washing System, includes hand sink with integral (welded) left and right side splashes, electronic eye splash mounted T&S faucet with battery saving hydro generator power source, touchless hand sanitizing dispenser, hands free soap dispenser, automated touchless paper towel dispenser, food handler glove rack, white bristle nail brush, with stainless steel skirt assembly in lieu of trash receptacle & end splashes on both ends, 304 stainless steel, NSF

ITEM #B94 WORK TABLE, MOBILE

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Work table, see plans for width, length, height, and configuration.
2. Standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions. Similar to standard details FSD1-7 and FSD1-10.
3. Island work table with undershelf, similar to detail FSD2-6.
4. 5" Heavy-duty casters, two (2) with brakes.
5. Straight turn-down edge profile similar to detail FSD1-1A.

ITEM #B95 SLICER

Quantity: One (1)
Manufacturer: Hobart
Model: HS7N-1

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Heavy Duty Meat Slicer, automatic, 13" CleanCut™ knife, burnished finish, (3) stroke lengths & (4) stroke speeds, removable meat grip assembly, removable ring guard cover, single action top mounted sharpener with Borazon™ stones, cleaning kickstand, 120v/60hz/1-ph, NSF cETLus

ITEM #B96 WORK TABLE W/ SINKS

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Worktable with sink, see plans and elevations for width, length, height, and configuration.
2. Standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions. Similar to standard details FSD1-7 and FSD1-10.
3. work table with undershelf, similar to detail FSD2-6.
4. Provide two integral sink similar to detail FSD2-8. Size and location as shown on plans and on elevations. Provide rotary waste assembly with overflow and lever bracket similar to detail FSD1-13.
5. Provide one (1) T&S B-0221 (or Fisher equal) deck mount faucet (12" spout) with wrist-action handles.
6. Straight turn-down edge profile similar to detail FSD1-1A.

ITEM #B97 ELECTRIC FOOD CUTTER

Quantity: One (1)
Manufacturer: Hobart
Model: 84186C-1

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Food Cutter, Correctional, with #12 attachment hub, 18" diameter stainless steel bowl 20 RPM, double stainless steel knives 1725 RPM, bowl cover with safety interlock, push/pull on/off switch, one-piece burnished aluminum housing, 3" legs, 1HP, NSF, UL

ITEM #B98 TRASH RECEPTACLE, 23 GALLON; QTY: 3, N.I.K.E.C.- BY OWNER/OPERATOR

ITEM #B99 FOOD PROCESSOR, BENCHTOP / COUNTERTOP

Quantity: One (1)
Manufacturer: Robot Coupe
Model: R2B

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Cutter/Mixer, 3 liter gray polycarbonate bowl with handle & see-thru lid, "S" blade with smooth edges, on/off & pulse switch, single speed, 1725 RPM, 1 HP, , cETLus, ETL-Sanitation

ITEM #B100 BLENDER, BAR

Quantity: One (1)
Manufacturer: Waring
Model: MX1500XTS

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Xtreme High-Power Blender, heavy duty, 64 oz. stainless steel container, electronic keypad, LCD display with blue backlight, (4) reprogrammable blending stations, sound enclosure, one piece removable jar pad, 3.5 HP, NSF, cETLus, Made in USA

ITEM #B101 WALL SHELF, DOUBLE

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Double-tier wall mounted shelf similar to standard detail FSD12-1A. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications & any fabrication details included in the contract drawings for precise & complete fabrication instructions.

ITEM #B102 SPARE NO.

ITEM #B103 SPARE NO.

ITEM #B104 SPARE NO.

ITEM #B105 SPARE NO.

ITEM #B106 SPARE NO.

ITEM #B107 WORK TABLE W/ SINK

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Work table with sink, see plans and elevations for width, length, height, and configuration.
2. Standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions. Similar to standard details FSD1-7 and FSD1-10.
3. Island work table with undershelf, similar to detail FSD2-6.
4. Provide integral sinks similar to detail FSD2-8. Size and location as shown on plans and on elevations. Provide rotary waste assembly with overflow and lever bracket similar to detail FSD1-13.
5. Provide Two (2) T&S B-0221 (or Fisher equal) deck mount faucet (12" spout) with wrist-action handles.
6. Provide flanged feet, anchor to floor.
7. Straight turn-down edge profile similar to detail FSD1-1A.
8. Provide utensil rack with overshelf, table mounted, similar to detail FSD14-1B.
9. Provide angle rack slides below similar to detail FSD1-29, number and location as shown on plans.
10. Provide 3-tier drawer assembly similar to detail FSD1-16, number and location as shown on plans.
11. Utility Chase to be similar to standard detail FSD1-41. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.

ITEM #B108 OVERSHELF - INCLUDED IN ITEM B107

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Single tiered over shelf to be similar to standard detail FSD1-28. Ceiling mounted similar to standard detail FSD14-3. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
2. Single-tier over shelf 2.25” thick 16-gauge stainless steel with double 14-gauge stainless steel hat channel support and 1.75” thick fully-welded-to shelf leg supports. Shelves to be supported from ceiling. All power, data, etc. to run inside upper supports to a concealed pathway below each shelf. See section details for more information.
3. Provide double run of LED lights at bottom shelf with rocker switch.
4. Provide 120-volt duplex electrical receptacles mounted within over shelves where shown on plans. Provide with stainless steel mounting brackets and cover plates. Conceal wiring in over shelf support. Terminate wiring at Pull Box, or Load Center, as specified in this item. Provide minimum load for each receptacle.
6. Provide electrical receptacles and junction boxes mounted within over shelves where shown on plans for heat lamps and printer. Provide with stainless steel mounting brackets and cover plates.

Conceal wiring in over shelf support. Terminate wiring at Pull Box, or Load Center, as specified in this item. Provide minimum load for each receptacle.

7. Fabricated Provide stainless-steel check minders numbered and length and location per elevations and plans.
8. Undermount printer shelf to be similar to standard detail FSD1-52. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
9. KEC to coordinate ceiling structural attachment and support and any potential clashing prior to fabrication.

ITEM #B109 TRASH RECEPTACLE, 23 GALLON; QTY: 2, N.I.K.E.C.- BY OWNER/OPERATOR

ITEM #B110 BUN / SHEET PAN RACK

Quantity: Two (2)
Manufacturer: Cres Cor
Model: 2821815

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Utility Rack, mobile, half-size, closed sides, extruded interlocking side walls act as pan slides on 1-1/2" centers, accepts 18" x 26" pans or plastic food boxes, 15 pan capacity, fully welded Hi-Tensile aluminum frame construction, (4) 3" swivel casters (2) braked, NSF

ITEM #B111 SPARE NO.

ITEM #B112 SPARE NO.

ITEM #B113 SPARE NO.

ITEM #B114 SPARE NO.

ITEM #B115 COMPRESSOR RACK

Quantity: One (1)
Manufacturer: RDT
Model: ZS1-02Z-CT4-AST

Fabricate/Furnish and set-in place per plans, details, and the following:

1. The system shall be an "UL Listed" air-cooled package system for outdoor installation. Pre-wired to main fused disconnect switch and pre-piped for single point connection. Flush mounted internal electrical panel. System shall be housed in a weather protected compact structural steel frame. The entire housing shall be brushed 304 stainless steel. The exterior of housing shall feature stainless steel one-piece louvers. The entire steel frame shall be pre-assembled, welded, cleaned

and painted with two coats of polyurethane. The condenser shall be multi circuited with aluminum fin copper tube and shall be designed for 10 degrees to 20 degrees TD.

2. Internal piping must meet ASHRAE standards for pressure drop and velocities. All copper piping must have a plastic bushing where secured to a steel support.
3. Receivers must be sized for 100% pump down of each system. Each suction line shall be insulated back to compressor suction valve. If liquid line is sub-cooled it must be insulated to each fixture it serves. System will be manufactured as single piece of equipment, no spilt condenser.
4. System will be manufactured with the following standard components, Semi- R-scroll compressors in parallel, fully redundant for med-temp units, XC645CS Controller by Dixell, receiver with relief valve and liquid level indicator, oil separator, liquid line solenoids, evaporator pressure regulator, stainless steel super hose connection, adjustable water regulators, complete manifold system pre-piped and mounted with temperature control, electric solenoid and service valve as needed, large capacity receiver, pre-wired defrost panel, suction accumulator, liquid sight glass, replaceable core suction filter, replaceable liquid filter drier. Ball shut-off valves on suction and liquid lines leaving the rack are required.
5. Unit shall be complete with CPC E2 temperature monitor controller manufactured by Emerson, which shall be located per plan. E.C. to wire Belden temperature control wiring to all refrigerated cavities except raised rails. KEC to coordinate this directly on-site.
6. Walk-in/base coils shall be direct expansion types of such size and design as to affect required temperatures and shall be provided per manufacturer’s drawings. Evaporators used will be all "Underwriters Laboratory Listed" supplied from factory with an expansion valve and solenoid valve pre-wired and pre-piped under nitrogen pressure and meet the refrigerant listed in schedule. Evaporator coils shall be direct expansion type fabricated of copper tubes with aluminum fins. All evaporators shall be provided with factory-mounted solenoid valve, thermostatic expansion valve and temperature sensor as well as on/off switch at coil for ease of repair.
7. All field piping installed as per factory standards and the sizing of the piping shall meet proper velocities as per factory standards. All refrigerant lines shall be extended to one side of the package in a neat and orderly manner. All tubing shall be securely supported and anchored with non-corrosive coated clamps. All joints must be welded and not soldered. All piping and controls shall be factory pressure-tested with nitrogen at 175 PSI. Piping Insulation will be foam type 25/50 smoke and fire type. Medium temperature will use 3/4" thick wall, low temperature will use 1" thick wall and sub-cooled liquid lines will use 3/4" thick wall. All field piping must have a plastic bushing wherever steel to copper tubing comes together. Include all labor, material, equipment, tools, refrigerant, oil, and other required accessories for the complete installation of the systems as shown and specified. Interconnection of all accessories accomplished for ease of servicing. Particular attention shall be given to proper install of tubing for oil return, refrigerant pressure drops and neatness. Placement of all exposed pipes approved prior to installation with General Contractor. Spacing of piping hangers shall be in accordance with factory standards and not to exceed 8'-0".
8. Furnish manufacturer's dimensional and schematic drawings and wiring diagrams. The factory must install this entire assembly.
9. After installation and before charging, evacuate all piping systems to a 500-micron evacuation. After evacuation, charge system with nitrogen and maintain pressure of 150% working pressure for 6 hours. Cap off, install pressure gauge and hold for 24 hours minimum. Re-evacuate, hold for 6 hours, charge and make electronic detector test all joints.
10. Final wiring of connections, conduit and/or pull boxes provided under applicable electrical and plumbing contracts.
11. All external exposed piping shall be fully insulated and covered with stainless steel weather-tight shields to provide a fully-enclosed raceway from rack to interior of building.
12. Included shall be a full one (1) year warranty for all parts by factory and labor on the entire refrigeration package by installing contractor, from the day of final acceptance of the installation

as previously specified. Factory shall also provide an extended one- (1) year service for rack system, coils and installation piping warranty on this scope of work. Manufacturer shall also include a five- (5) year extended warranty on the compressors for exchange, client to pay all freight charges. All defective or replaced parts must be returned to the factory for replacement. Lack of maintenance, nuisance calls or miss-setting of temperature controls at evaporators, are not covered under labor warranty.

13. KEC to provide field-coordinated sleeving and refrigeration line-run plan shop drawings for review.
14. Unit to be set on concrete housekeeping pad 4” tall, 3” beyond plan of rack. Pad by G.C.

ITEM #B116 CORNER GUARD

Quantity: Fifteen (15)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Similar to standard detail FSD1-40. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.

ITEM #C1 WORK COUNTER W/ SINK

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Work counter, see plans for width, length, height, and configuration.
2. Similar to standard details; FSD5-1, FSD1-7, FSD1-10, and FSD1-23. These standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
3. Provide single integral sink similar to detail FSD5-2. Size and location as shown on plans and on elevations. Provide rotary waste assembly with overflow and lever bracket similar to detail FSD1-13.
4. Provide one (1) T&S B-0221 (or Fisher equal) deck mount faucet (12" spout). Provide with wrist-action handles.
5. Cabinet base, with adjustable middle shelf as shown on elevations.
6. Doors to have continuous pulls.
7. Provide keyed locks for doors.
8. Removable, stainless steel kick plates on public sides.
9. 4"-high square turn-back splash at walls similar to detail FSD1-5B.

ITEM #C2 WALL SHELF, DOUBLE WITH CONCEALED BRACKETS

Quantity: One (1)
Manufacturer: Fabricated

Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Double wall shelf with concealed brackets.

ITEM #C3 REACH-IN FREEZER

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: 1FN

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Freezer, reach-in, one-section, 20 cu. ft., self-contained refrigeration, stainless steel front, aluminum interior & ends, standard depth, full-height solid door, cylinder lock, LED interior lighting, electronic control with digital display, unit can be adjusted to operate as low as -10°F, hi-low alarm, electric condensate evaporator, R290 Hydrocarbon refrigerant, 1/2 HP, cETLus, NSF, ENERGY STAR®
2. Cord & Plug, standard
3. Door as per plan
4. 5" Casters, standard

ITEM #C4 REACH-IN REFRIGERATOR

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: 2REN

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Extra-Wide Refrigerator, reach-in, 57"W, two-section, self-contained refrigeration, stainless steel front, aluminum interior & ends, standard depth, full-height solid doors, cylinder locks, electronic control with digital display, hi-low alarm, electric condensate evaporator, R290 hydrocarbon refrigerant, 1/3 HP, cETLus, NSF, ENERGY STAR®
2. cord, , standard
3. Door as per plan
4. 5" Casters, standard

ITEM #C5 WORK COUNTER

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Work counter, see plans for width, length, height, and configuration.
2. Similar to standard details; FSD5-1, FSD1-7, FSD1-10, and FSD1-23. These standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any

fabrication details included in the contract drawings for precise and complete fabrication instructions.
3. Straight turn-down edge profile similar to detail FSD1-1A.
4. Cabinet base.
5. Removable, stainless steel kick plates on public sides.
6. Provide open shelving with adjustable middle shelf as shown on elevations.
7. Provide open space for under counter for equipment as shown on plans. Coordinate fabrication so that equipment fits completely under top.
8. Ship Hand Sink Item C5.1 to Fabricator to install in table at factory. Mount to underside of table, fully weld and polish all edges.

ITEM #C5.1 HAND SINK

Quantity: One (1)
Manufacturer: Eagle Group
Model: HWB-T

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hand Sink, Drop-In, one compartment, 17-1/2" x 16-1/2" x 17-1/4"H, type 304 stainless steel welded construction, 9-1/4" x 11-1/2" x 6" bowl, bullnose front edge, T&S deck mount gooseneck faucet with wrist handles, basket drain, soap on rear deck, C-fold towel dispenser, hinged door with pull handle & magnetic catch, NSF.
2. Ship to Fabricator to Install in Work Counter Item C5.
3. Mount to underside of table, fully weld and polish all edges.

ITEM #C6 UNDERCOUNTER REFRIGERATOR

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: D32N-U

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Designer Line Undercounter Refrigerator, 32"W, one-section, (1) field rehingeable door, stainless steel exterior & interior, stainless steel top, 1-3/8" diameter plate casters, front breathing, electronic control with digital display, hi-low alarm, rear mounted self-contained refrigeration, R290 hydrocarbon refrigerant, 1/5 hp, cETLus, NSF, ENERGY STAR®
2. cord & plug, standard
3. Door hinged as per plan

ITEM #C7 WALL SHELF, DOUBLE WITH CONCEALED BRACKETS

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Double wall shelf with concealed brackets.

ITEM #C8 HEATED HOLDING CABINET

Quantity: Two (2)
Manufacturer: Alto-Shaam
Model: 1200-UP

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Halo Heat® Low Temperature Holding Cabinet, double compartment, on/off simple controller with adjustable thermostats, indicator light, (2) sets of chrome plated universal side rails, (4) sets of pan slides, (16) 20" x 12" x 2-1/2" full size pan capacity, heavy stainless steel exterior, 5" casters; 2 rigid, 2 swivel with brakes, EcoSmart®, cULus, UL EPH Classified, CE, IPX4, TUV NORD, EAC
2. Cord & Plug, standard
3. Reach-in design, standard
4. Solid door, hinged as per plan

ITEM #C9 SPARE NO.

ITEM #C10 SPARE NO.

ITEM #C11 SPARE NO.

ITEM #C12 REACH-IN FREEZER

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: 1FN

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Freezer, reach-in, one-section, 20 cu. ft., self-contained refrigeration, stainless steel front, aluminum interior & ends, standard depth, full-height solid door, cylinder lock, LED interior lighting, electronic control with digital display, unit can be adjusted to operate as low as -10°F, hi-low alarm, electric condensate evaporator, R290 Hydrocarbon refrigerant, 1/2 HP, cETLus, NSF, ENERGY STAR®
2. Cord & Plug, standard
3. Door hinged as per plan
4. 5" Casters, standard

ITEM #C13 PIZZA BAKE OVEN, ELECTRIC

Quantity: One (1)
Manufacturer: Marra Forni
Model: ELNP39-43

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Neapolitan-style tiled exterior ,Free Standing, Electric - Stone hearth oven composed of a unique refractory brick composition, including volcanic material, to provide and maintain cooking temperatures up to 950° F, mounted on a steel stand with optional direct ventilation.
2. Exterior size of the oven shall be 79-1/8” H x 58-1/4” W x 66-3/4” D , cooking area will measure 38-7/8” W x 42-5/8” D. Front loading opening will measure 5-1/2” (432mm) in height , provided with a removable front door, for freestanding installation
3. Interior lighting for full-time monitoring of the cooking process
4. Feature a programmable electronic controller with individuallyadjustable upper and lower temperatures, selectable menus, and timed on/ off features to accommodate a variety of cooking requirements, Heating to be accomplished by upper and lower radiant infrared electric heating elements.
5. Galvanneal metal interior walls and ceiling , Matte black front façade, Matte black steel stand
6. Manufactured in the U.S.A. and comply with all applicable FTC requirements for this status
7. Due to the weight of the unit, follow manufacturer’s instructions for shipping, handling, unloading and installation.

ITEM #C13.1 DIRECT VENT AND FAN

Quantity: One (1)
Manufacturer: Marra Forni
Model: CUSTOM

ITEM #C14 WORKTABLE, ISLAND

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Work table, see plans for width, length, height, and configuration.
2. Similar to standard details; FSD5-1, FSD1-7, FSD1-10, and FSD1-23. These standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
3. Straight turn-down edge profile similar to detail FSD1-1A-.
4. Provide with finished top, back, and sides.

ITEM #C15 PIZZA PREP TABLE

Quantity: One (1)
Manufacturer: Infrico USA
Model: IRT-MR93EN

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Pizza Prep Table, Refrigerated, three-section, 27.0 cu. ft. capacity, (3) self-closing doors, (2) plastic coated extra-dense wire shelves per section with universal stainless steel tray slides included, digital controller, stainless steel insulated lid, top included (12) 1/3 polycarbonate food pans, side mounted, slide-out self-contained refrigeration, 300 series stainless steel exterior & interior, R290 Refrigerant, 3/4 HP, cETLus, ETL-Sanitation, NSF7
2. (lower), (upper),
3. Cord & Plug, standard
4. 4" casters (2 with locks) standard

ITEM #C16 MAKE UP AIR DIFFUSER

Quantity: Four (4)
Manufacturer: Halton Company
Model: KCD

Fabricate/Furnish and set-in place per plans, details, and the following:

1. 24"x 48" ceiling diffuser. Provide as shown on QF-702 sheet series drawings.

ITEM #C17.1 EXHAUST HOOD

Quantity: One (1)
Manufacturer: Halton Company
Model: KVM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Halton KVM Filter Type Exhaust Hood with Capture Jet™ 2nd generation system.
2. Provide per fabricator's detail drawings in QF-700 sheet series. Halton drawing number reference U24-599.
3. The canopy shall bear UL or ETL labels and be listed as “range hood without exhaust fire damper” per standard 710 and be fabricated in compliance with NFPA-96 and shall bear the National Sanitation Foundation seal of approval.
4. The canopy inner liner shall be 100% 18-gauge stainless steel, type 304 with #4 finish. Each canopy shall have a filter housing of the same material as the canopy liner. The filter housing shall be equipped with a concealed drip tray the full length of the canopy and with a grease cup for easy removal and daily cleaning.
5. The exhaust airflow will be based on the convective heat generated by the appliances underneath each canopy. Submittal shall include convective heat calculations based on the input power of the appliance served and efficiency of hood system consistent with results of independent test based on ASTM Standards F-1704-05 Capture & Containment and F-2474-05 Heat Gain to Space.
6. Final air volume calculations shall comply with the hood listing. The use of end panels or rear seals to achieve required airflows are not acceptable. Use of Capture Walls to create a seal between cooking equipment and wall shall not be used as they require cooking equipment to be located further from wall reducing isle space
7. The Capture Jet air shall be introduced through a special discharge panel and shall not exceed 15% of the calculated exhaust airflow. The Capture Jet discharge velocity will be a minimum of 1500 FPM. Slot type discharge shall not be used. The Capture Jet air increases the capture efficiency of the smoke and contaminated air at both the face and sides of the hood. The Capture Jet chamber is to be fully insulated.

8. Provide hood pre piped for Fire Suppression System. Final connections to hood duct collar(s) by the Mechanical Division. Hood construction and components to be UL and NSF listed. Provide hood mounted switch panel for fan and lights. Mounting height of bottom edge of hood to be 6'-8" above finished floor. Verify and coordinate all dimensions, and duct requirements and locations with site and Mechanical Division. See ventilation drawing sheet for general size and location of duct(s). If not installed against the finished ceiling, provide matching stainless steel closure panels above hood to finished ceiling, to conceal duct(s) and hood fire suppression system piping; verify height.
9. The hood shall be equipped with model KSA multi-cyclone stainless steel grease extractors. Filters shall be rated at 93%-98% extraction efficiency on particulates in the 5-10-micron range based on ASTM Standard F-2519-05. The pressure loss over the extractor shall not exceed 0.50" of water at flow rates approved by UL for heavy load cooking. Sound levels shall not exceed an NC rating of 55. Baffle or slot type extractors shall not be used. The hood shall be supplied with a control panel on the face of the hood consisting of: Exhaust Fan Switch with pilot light. Light Switch with pilot light. Hangers, supports and miscellaneous accessories as required for installation. The installation shall be in accordance with the manufacturer's recommendations and conform to NFPA-96 guidelines and all applicable local codes. Air space at wall(s) to accommodate requirements of the latest edition of NFPA 96 clearance to combustibles. All welded duct collar(s). Provide with stainless steel compartment at end of hood for housing Fire Suppression System, if shown on drawings.
10. Hood shall be provided with hood mounted temperature sensor and control panel designed and installed to automatically activate the exhaust fan whenever cooking operation occurs. The activation of the exhaust fan shall occur through and interlock with the cooking appliances, by means of heat sensor, per IMC 2006 507.2.1.1 requirements.
11. Hood shall provide provisions for the Halton Safeguard system including M.A.R.V.E.L. demand control system, AirWatch IEQ sensor, and Fire Watch early fire warning system. System shall include Halton Infrared Radiation Index Sensors (IRIS). Temp only systems shall not be allowed. System provided with model ABD automated balancing dampers to modulate airflow at each individual hood section. System shall be provided with BACnet gateway for direct communication to BMS and control panel with touchscreen for user interface. (1) control panel shall be provided for hood. System provided with Halton model KGS grease sensing system to monitor grease build-up in exhaust ductwork, signaling the operator when grease accumulation in ductwork exceeds NFPA cleaning required levels.
12. Provide and install Halton Patent Pending LED light fixture with the following certifications U.L., CSA, NSF and CE for use in grease exhaust hoods in quantity sufficient to provide 50 foot candles at the 36" A.F.F. cooking surface when hood is mounted 84" A.F.F. Halton LED light fixture is complete with die cast aluminum junction box with integral fins for natural heat dissipation. Input voltage of 24VDC with a power consumption not to exceed . The housing encases 24 LED light emitters with a brightness of 1000 lumens. Lighting color shall be cool white (fluorescent). Lamp body is stainless steel ring with a high temperature silicone seal. Junction box to accept standard ½" NPT fitting. Fixture shall come complete with integral power supply with an input voltage of 108VAC 305VAC and input frequency of 50/60 Hz. Input current rating shall be @ 120VAC. Fixture shall contain no mercury or lead.
13. This hood is to be integrated into a MARVEL system. It is the intent of this specification that the exhaust hood, fire suppression system, and supply air plenum, Automatic Balancing Dampers (ABD), and MARVEL control panel are to be provided and installed by the Kitchen Equipment Contractor. The VFD's are to be located, supplied and installed by the Mechanical Contractor.
14. Switch Panel to include Hood ON/OFF Light Switch and Fan ON/OFF Switch. Switch Panel to be Remote Mounted.
15. Kitchen Equipment Contractor (K.E.C.) shall provide fire wrap insulation on top of the hood if required by local code authority.
16. Provide with KCD supply air diffusers as shown on hood detail drawings.

ITEM #C17.2 EXHAUST HOOD

Quantity: One (1)
Manufacturer: Halton Company
Model: KVM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Halton KVM Filter Type Exhaust Hood with Capture Jet™ 2nd generation system.
2. Provide per fabricator's detail drawings in QF-700 sheet series. Halton drawing number reference U24-599.
3. The canopy shall bear UL or ETL labels and be listed as “range hood without exhaust fire damper” per standard 710 and be fabricated in compliance with NFPA-96 and shall bear the National Sanitation Foundation seal of approval.
4. The canopy inner liner shall be 100% 18-gauge stainless steel, type 304 with #4 finish. Each canopy shall have a filter housing of the same material as the canopy liner. The filter housing shall be equipped with a concealed drip tray the full length of the canopy and with a grease cup for easy removal and daily cleaning.
5. The exhaust airflow will be based on the convective heat generated by the appliances underneath each canopy. Submittal shall include convective heat calculations based on the input power of the appliance served and efficiency of hood system consistent with results of independent test based on ASTM Standards F-1704-05 Capture & Containment and F-2474-05 Heat Gain to Space.
6. Final air volume calculations shall comply with the hood listing. The use of end panels or rear seals to achieve required airflows are not acceptable. Use of Capture Walls to create a seal between cooking equipment and wall shall not be used as they require cooking equipment to be located further from wall reducing isle space
7. The Capture Jet air shall be introduced through a special discharge panel and shall not exceed 15% of the calculated exhaust airflow. The Capture Jet discharge velocity will be a minimum of 1500 FPM. Slot type discharge shall not be used. The Capture Jet air increases the capture efficiency of the smoke and contaminated air at both the face and sides of the hood. The Capture Jet chamber is to be fully insulated.
8. Provide hood pre piped for Fire Suppression System. Final connections to hood duct collar(s) by the Mechanical Division. Hood construction and components to be UL and NSF listed. Provide hood mounted switch panel for fan and lights. Mounting height of bottom edge of hood to be 6'-8" above finished floor. Verify and coordinate all dimensions, and duct requirements and locations with site and Mechanical Division. See ventilation drawing sheet for general size and location of duct(s). If not installed against the finished ceiling, provide matching stainless steel closure panels above hood to finished ceiling, to conceal duct(s) and hood fire suppression system piping; verify height.
9. The hood shall be equipped with model KSA multi-cyclone stainless steel grease extractors. Filters shall be rated at 93%-98% extraction efficiency on particulates in the 5-10-micron range based on ASTM Standard F-2519-05. The pressure loss over the extractor shall not exceed 0.50" of water at flow rates approved by UL for heavy load cooking. Sound levels shall not exceed an NC rating of 55. Baffle or slot type extractors shall not be used. The hood shall be supplied with a control panel on the face of the hood consisting of: Exhaust Fan Switch with pilot light. Light Switch with pilot light. Hangers, supports and miscellaneous accessories as required for installation. The installation shall be in accordance with the manufacturer's recommendations and conform to NFPA-96 guidelines and all applicable local codes. Air space at wall(s) to accommodate requirements of the latest edition of NFPA 96 clearance to combustibles. All welded duct collar(s). Provide with stainless steel compartment at end of hood for housing Fire Suppression System, if shown on drawings.

10. Hood shall be provided with hood mounted temperature sensor and control panel designed and installed to automatically activate the exhaust fan whenever cooking operation occurs. The activation of the exhaust fan shall occur through and interlock with the cooking appliances, by means of heat sensor, per IMC 2006 507.2.1.1 requirements.
11. Hood shall provide provisions for the Halton Safeguard system including M.A.R.V.E.L. demand control system, AirWatch IEQ sensor, and Fire Watch early fire warning system. System shall include Halton Infrared Radiation Index Sensors (IRIS). Temp only systems shall not be allowed. System provided with model ABD automated balancing dampers to modulate airflow at each individual hood section. System shall be provided with BACnet gateway for direct communication to BMS and control panel with touchscreen for user interface. (1) control panel shall be provided for hood. System provided with Halton model KGS grease sensing system to monitor grease build-up in exhaust ductwork, signaling the operator when grease accumulation in ductwork exceeds NFPA cleaning required levels.
12. Provide and install Halton Patent Pending LED light fixture with the following certifications U.L., CSA, NSF and CE for use in grease exhaust hoods in quantity sufficient to provide 50 foot candles at the 36" A.F.F. cooking surface when hood is mounted 84" A.F.F. Halton LED light fixture is complete with die cast aluminum junction box with integral fins for natural heat dissipation. Input voltage of 24VDC with a power consumption not to exceed . The housing encases 24 LED light emitters with a brightness of 1000 lumens. Lighting color shall be cool white (fluorescent). Lamp body is stainless steel ring with a high temperature silicone seal. Junction box to accept standard ½" NPT fitting. Fixture shall come complete with integral power supply with an input voltage of 108VAC 305VAC and input frequency of 50/60 Hz. Input current rating shall be @ 120VAC. Fixture shall contain no mercury or lead.
13. This hood is to be integrated into a MARVEL system. It is the intent of this specification that the exhaust hood, fire suppression system, and supply air plenum, Automatic Balancing Dampers (ABD), and MARVEL control panel are to be provided and installed by the Kitchen Equipment Contractor. The VFD's are to be located, supplied and installed by the Mechanical Contractor.
14. Switch Panel to include Hood ON/OFF Light Switch and Fan ON/OFF Switch. Switch Panel to be Remote Mounted.
15. Kitchen Equipment Contractor (K.E.C.) shall provide fire wrap insulation on top of the hood if required by local code authority.
16. Provide with KCD supply air diffusers as shown on hood detail drawings.

ITEM #C17.3 HOOD CONTROL CABINET

Quantity: One (1)
Manufacturer: Halton
Model: M.A.R.V.E.L.

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Wall mounted cabinet to control M.A.R.V.E.L. intelligent demand-controlled ventilation system.
2. Controls for exhaust hoods items C17
3. Provide per fabricator's detail drawings in QF-700 sheet series. Halton drawing number reference U24-599.
4. Inter-wiring by E.C. and Low-Voltage Contractor.

ITEM #C18 FIRE SUPPRESSION SYSTEM

Quantity: One (1)
Manufacturer: Ansul Fire Protection

Model: ANSUL R-102

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Ansul R 102 Ansulex Liquid Fire Suppressant. Surface appliance nozzles, hood and duct protection nozzles in Exhaust Hood Item B56.1,B56.2,
2. Provide per fabricator's detail drawings in QF-700 sheet series. Halton drawing number reference U24-599 .
3. Manual pull station and micro switches with two sets of normally open and two sets of normally closed contact points. All exposed pipe and fittings to be chrome plated or stainless steel. All components and labor necessary for completely installed system in accordance with manufacturer’s listings and instructions, U.L. Standard 300, UL Standard 1254, NFPA NFPA-96, and all applicable local codes, standards, and regulations. Components inside exhaust hood to be installed at hood manufacturer's shop. The system shall include factory prepipe, all permits, and test as required by the authority having jurisdiction.
4. Components inside exhaust hood to be installed at hood manufacturer's shop during fabrication. Coordinate size(s) and installation with Plumbing Division. Six month and twelve month inspections, servicing, and replacement of components as per N.F.P.A. 96. Electrical Division to provide shunt trip breakers at main power panel, or disconnects, as designated by the Electrical Engineer; interconnected with micro switch at fire system control panel, for all electricity in and under exhaust hood. Shunt trips/disconnects to accomplish shut off of electricity in event of fire system activation. Ansul to provide complete shop drawings, locate and/or verify and coordinate system tank(s), panel(s), and pull station(s) location(s) and requirements, and verify and coordinate with Mechanical Engineer's documents and Division 15's exhaust and supply air requirements for hood(s); for proper protection of hood(s) and equipment in and below the hood(s), controlling of associated components, and interconnection of multiple fire systems as required. Provision and installation of components and system(s) to be by dealer and installer authorized, factory trained, and certified to sell, install, and service Ansul fire suppression system(s) as noted in this specification, at the time of bidding, installation, start-up, and warranty period of this project. Six month and twelve-month inspections, servicing, and replacement of components as per N.F.P.A. 96. Electrical Division provide shunt trip breakers at main power panel, or disconnects, as designated by the Electrical Engineer; interconnected with micro switch at fire system control panel, for all electricity in and under exhaust hood. Shunt trips/disconnects to accomplish shut off of electricity in event of fire system activation.
4. Ansul to provide complete shop drawings, locate and/or verify and coordinate system tank(s), panel(s), and pull station(s) location(s) and requirements, and verify and coordinate with Mechanical Engineer's documents and Division 15's exhaust and supply air requirements for hood(s); for proper protection of hood(s) and equipment in and below the hood(s), controlling of associated components, and interconnection of multiple fire systems as required. Provision and installation of components and system(s) to be by dealer and installer authorized, factory trained, and certified to sell, install, and service Ansul fire suppression system(s) as noted in this specification, at the time of bidding, installation, start-up, and warranty period of this project.
5. As part of this item, provide wall mounted type K Ansul hand held portable fire extinguisher, placard, and mounting bracket as required in the immediate vicinity of each cooking area, per NFPA-96 and NFPA-10. Additional fire extinguishers as required in the kitchen area are to be specified by the Architect and provided by the General Contractor.
6. EC to wire wall mounted reset button and control panel mounted in fire suppression bottle cabinet. Mount reset button at 48" AFF where shown on drawings.

ITEM #C19 WALL FLASHING

Quantity: One (1)
Manufacturer: Fabricated
Model: Stainless Steel

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Similar to standard detail FSD1-39. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
2. Provide 20 gauge stainless steel panels from top of coved tile base to ceiling.

ITEM #C20 FRYER BATTERY, ELECTRIC

Quantity: One (1)
Manufacturer: Pitco Frialator (Middleby)
Model: SE14RS-2FD

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Solstice™ Prepackaged Fryer System with Solstice™ Filter Drawer System, High Power, electric, (2) 50 lb. oil capacity full tanks, solid state controls, boil out, drain valve interlock, melt cycle, stainless steel tank, front & sides, under-fryer drawer filtration, total (-FF), ENERGY STAR®, cULus, NSF, CE, GS
2. NOTE: Power supply for basket lifts and filter motor is hard wired at the factory for 208v, 240v models
3. (2) DIRECT
4. Solid State Thermostat, standard
5. Basket, (2) oblong/twin size, 13-1/2" x 6-1/2" x 5-3/4" deep, long handle, regular mesh (shipped std (n/c) with models "T" SG14, SG14R, SSH55, SE14, SE14X, SE14B, SG14T, 35+, 45+, fryer batteries shipped with (1) per fryer
6. 9" legs, standard

ITEM #C21 FRYER DUMP STATION

Quantity: One (1)
Manufacturer: Pitco Frialator (Middleby)
Model: BNB-SSH55

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Solstice Supreme™ Bread & Batter Cabinet, with BNB dump station, fryer match design, approximately 15-5/8" wide, includes 4-5/8" recessed pan and screen, standard finish, stainless steel front, sides & door, for prepackage system SSH55 fryers, NSF

ITEM #C22 SPARE NO.

ITEM #C23 CHARBROILER

Quantity: Two (2)
Manufacturer: Wells (Middleby)
Model: B-40

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Charbroiler, countertop, electric, 4" high legs, cast iron grate, 24" wide, stainless-steel construction, with grease pan and scraper/brush, UL, CE

ITEM #C23.1 EQUIPMENT STAND, REFRIGERATED BASE

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: D48GN

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Refrigerator Griddle Stand, one-section, (2) drawers, accommodates (2) 12" x 20" x 6", stainless steel top with drip guard marine edge, stainless steel exterior & interior, electronic control with digital display, hi-low alarm, high/low temperature alarm, self-contained refrigeration, R290 hydrocarbon refrigerant, 1/5 HP, 10' cord, cETLus, NSF, ENERGY STAR®
2. Cord & Plug, standard
3. Condensing unit on the right, standard
4. Casters, 3" diameter, 4"H overall, standard

ITEM #C24 INDUCTION RANGE, FLOOR MODEL

Quantity: One (1)
Manufacturer: Lang Manufacturing (Middleby)
Model: RI36C-ATE

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Induction Range, electric, floor model, 36"W, (6) 8" glass induction hobs, convection oven base with (6) rack positions and (3) racks, 150°-450°F solid state oven thermostat with 1-hour timer, 2" vented stainless steel stub back, 430 stainless steel exterior, 6" casters, cULus, NSF

ITEM #C25 GRIDDLE, ELECTRIC, COUNTERTOP

Quantity: One (1)
Manufacturer: Lang Manufacturing (Middleby)
Model: 136S

Fabricate/Furnish and set-in place per plans, details, and the following:

1. LG Series Griddle, electric, countertop, 36" W x 23" D cooking surface, 1" highly polished steel griddle plate, Selectronic™ solid state control every 12", 5-1/2" high side and backsplash, grease trough, temperature range 175° - 450°F, stainless steel exterior, 4" casters, NSF, cETLus, Made in USA

ITEM #C25.1 REFRIGERATED EQUIPMENT STAND

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: D36GN

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Refrigerator Griddle Stand, one-section, (2) drawers - accommodates (1) 12" x 20" x 6" & (1) 6" x 20" x 6", stainless steel top with drip guard marine edge, stainless steel exterior & interior, electronic control with digital display, hi-low alarm, high/low temperature alarm, self-contained refrigeration, R290 hydrocarbon refrigerant, 1/5 HP, 10' cord, cETLus, NSF, ENERGY STAR®
2. Cord & Plug, standard
3. Condensing unit on the right, standard
4. Casters, 3" diameter, 4"H overall, standard

ITEM #C26 CONVECTION OVEN, ELECTRIC

Quantity: One (1)
Manufacturer: Vulcan
Model: VC55ED

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Convection Oven, electric, double-deck, standard depth, solid state controls, 5-hour timer with digital display enhancement, 150° to 500°F temperature range, (5) oven racks per deck, independently operated removable doors with double pane windows, porcelain on steel interior, interior light, stainless steel front, top & on casters, (2) 1/2 HP blower motors, NSF, UL, ENERGY STAR®
2. (2) standard

ITEM #C27 SPARE NO.

ITEM #C28 SPARE NO.

ITEM #C29 SPARE NO.

ITEM #C30 SPARE NO.

ITEM #C31 WORK COUNTER W/ SINK

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Worktable, see plans for width, length, height, and configuration.
2. Standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions. Similar to standard details FSD1-7 and FSD1-10.
3. Provide stainless steel adjustable bullet feet
4. Straight turn-down edge profile similar to detail FSD1-1A.
5. Provide open space for under-counter equipment's as shown on plans. Coordinate fabrication so that equipment fits completely under top. .
6. Provide angle rack slides, similar to detail FSD1-29, number and location as shown on plans & elevation.
7. Utility Chase to be similar to standard detail FSD1-41. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
8. Ship Hand Sink Item C31.1 to Fabricator to install in table at factory. Mount to underside of table, fully weld and polish all edges.

ITEM #C31.1 HAND SINK

Quantity: One (1)
Manufacturer: Eagle Group
Model: HWB-T

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hand Sink, Drop-In, one compartment, 17-1/2" x 16-1/2" x 17-1/4"H, type 304 stainless steel welded construction, 9-1/4" x 11-1/2" x 6" bowl, bullnose front edge, T&S deck mount gooseneck faucet with wrist handles, basket drain, soap on rear deck, C-fold towel dispenser, hinged door with pull handle & magnetic catch, NSF.
2. Ship to Fabricator to Install in Work Table Item C31.
3. Mount to underside of table, fully weld and polish all edges

ITEM #C31.2 HAND SINK to be deleted if being replaced with a utility sink

Quantity: One (1)
Manufacturer: Eagle Group
Model: HWB-T

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Drop-In Hand Sink, one compartment, 17-1/2" x 16-1/2" x 17-1/4"H, type 304 stainless steel welded construction, 9-1/4" x 11-1/2" x 6" bowl, bullnose front edge, T&S deck mount gooseneck faucet, basket drain, soap on rear deck, C-fold towel dispenser, hinged door with pull handle & magnetic catch, NSF

ITEM #C32 UNDERCOUNTER REFRIGERATOR

Quantity: Two (2)
Manufacturer: Continental Refrigerator

Model: D48N-U-D

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Designer Line Undercounter Refrigerator, 48"W, two-section, (4) drawers, accommodates (1) 12 x 18 x 6 pan per drawer or (1) 1/2 x 6 pan & (1) 1/3 x 6 pans per drawer capacity (supplied by others), stainless steel exterior & interior, stainless steel top, 1-3/8" diameter plate casters, front breathing, electronic control with digital display, hi-low alarm, rear mounted self-contained refrigeration, R290 hydrocarbon refrigerant, 1/5 hp, cETLus
2. cord & plug, standard

ITEM #C33 SPARE NO.

ITEM #C34 SPARE NO.

ITEM #C35 SPARE NO.

ITEM #C36 SPARE NO.

ITEM #C37 REACH-IN REFRIGERATOR

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: 1REN

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Extra-Wide Refrigerator, reach-in, 28-1/2"W, one-section, self-contained refrigeration, stainless steel front, aluminum interior & ends, standard depth, full-height solid door, cylinder lock, electronic control with digital display, hi-low alarm, electric condensate evaporator, R290 Hydrocarbon refrigerant, 1/4 HP, cETLus, NSF, ENERGY STAR®
2. Cord & Plug, standard
3. Doors hinged per plan
4. 5" Casters, standard

ITEM #C38 REACH-IN REFRIGERATOR

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: 2REN

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Extra-Wide Refrigerator, reach-in, 57"W, two-section, self-contained refrigeration, stainless steel front, aluminum interior & ends, standard depth, full-height solid doors, cylinder locks, electronic control with digital display, hi-low alarm, electric condensate evaporator, R290 hydrocarbon refrigerant, 1/3 HP, cETLus, NSF, ENERGY STAR®

2. Cord & Plug, standard
3. Doors hinged per plan
4. 5" Casters, standard

ITEM #C39 WORK COUNTER W/ SINK

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Work counter, see plans for width, length, height, and configuration.
2. Similar to standard details; FSD5-1, FSD1-7, FSD1-10, and FSD1-23. These standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
3. Provide single integral sink similar to detail FSD5-2. Size and location as shown on plans and on elevations. Provide rotary waste assembly with overflow and lever bracket similar to detail FSD1-13.
4. Provide one (1) T&S B-0221 (or Fisher equal) deck mount faucet (12" spout). Provide with wrist-action handles.
5. Cabinet base, with adjustable middle shelf as shown on elevations.
6. Doors to have continuous pulls.
7. Provide keyed locks for doors.
8. Removable, stainless steel kick plates on public sides.
9. 4"-high square turn-back splash at walls similar to detail FSD1-5B.

ITEM #C40 WALL SHELF, DOUBLE WITH CONCEALED BRACKETS

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Double wall shelf with concealed brackets.

ITEM #C41 HYDROPONIC CASE

Quantity: One (1)
Manufacturer: Babylon Farms
Model: E527333

1. Hyrdoponic case, Sustainable year -round growth. Overall size, 67”width x 29.75” depth x 79.75” height. suitable for growing, 45+ leafy greens, Herbs or microgreens. Different yields averages based on the crop.
2. Unit furnished with Double leak detection sensors, Dishwasher-safe grow trays, Non-caustic GrowFoam™ growth medium,Safety glass,Dual-zone lockable drawer/cabinet,Built-in GFCI

Auto-shutdown features, Isolatable connectivity,Pre-install water testing,Food-safe cleaning supplies,Training and maintenance videos, FCC/UL/CE approvals

ITEM #C42 WORK COUNTER

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Work counter, see plans for width, length, height, and configuration.
2. Similar to standard details; FSD5-1, FSD1-7, FSD1-10, and FSD1-23. These standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
3. Straight turn-down edge profile similar to detail FSD1-1A.
4. Cabinet base.
5. Doors to have continuous pulls.
6. Provide keyed locks for doors.
7. Removable, stainless steel kick plates on public sides.
8. Provide adjustable middle shelf as shown on elevations.
9. Provide open space for under counter for equipment as shown on plans. Coordinate fabrication so that equipment fits completely under top.
10. 4"-high square turn-back splash at walls similar to detail FSD1-5B.
11. Ship Hand Sink Item C42.1 to Fabricator to install in table at factory. Mount to underside of counter, fully weld and polish all edges

ITEM #C42.1 HAND SINK

Quantity: One (1)
Manufacturer: Eagle Group
Model: HWB-T

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Drop-In Hand Sink, one compartment, 17-1/2" x 16-1/2" x 17-1/4"H, type 304 stainless steel welded construction, 9-1/4" x 11-1/2" x 6" bowl, bullnose front edge, T&S deck mount gooseneck faucet, basket drain, soap on rear deck, C-fold towel dispenser, hinged door with pull handle & magnetic catch, NSF
2. Ship to Fabricator to Install in Work Counter Item C5.
3. Mount to underside of table, fully weld and polish all edges.

ITEM #C43 WALL SHELF, DOUBLE WITH CONCEALED BRACKETS

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Double wall shelf with concealed brackets.

ITEM #C44 RAPID COOK OVEN

Quantity: Two (2)
Manufacturer: TurboChef (Middleby)
Model: ECO (BLACK)

Fabricate/Furnish and set-in place per plans, details, and the following:

1. ECO-9500-805 (Black) ECO™ Convection/Microwave Oven, Rapid Cook, electric, 16.1" wide, ventless, countertop, fully insulated cook chamber, stores up to 256 recipes, internal catalytic converter, smart voltage sensor technology (US only),One Touch Controls,, removable rack and grease collection pan, bottom jet plate, pull down door with ergonomic handle, 13 1/2" x 14 1/4, TurboChef Cleaner and Guard Starter Kit, includes (1) cleaner packet, (1) 24oz bottle, (1) Guard bottle and (2) foamer trigger, aluminum paddle, (2) solid aluminum pans, side hand grips, stainless steel front, top & sides, cULus, CE, UL EPH Classified, TUV
2. Open Kitchen bundle, includes - 1 x ConnectWare module, 1 x Secure Access Point (SAP), 3 year subscription for Open Kitchen (NET price displays when item is added to quote)
3. All items FOB: Carrollton, Texas: Consumable/accessory orders less than $5,000 will incur a handling fee. Orders shipping standard ground will incur a $15.00 handling fee. Orders shipping other than standard ground will incur $25.00 handling fee
4. (ECO) 208/6 ft. Cord & Plug (nominal), standard
5. Touch controls, standard

ITEM #C45 UNDERCOUNTER REFRIGERATOR

Quantity: Two (2)
Manufacturer: Continental Refrigerator
Model: D48N-U

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Designer Line Undercounter Refrigerator, 48"W, two-section, (2) field rehingeable doors, stainless steel exterior & interior, stainless steel top, 1-3/8" diameter plate casters, front breathing, electronic control with digital display, hi-low alarm, rear mounted self-contained refrigeration, R290 hydrocarbon refrigerant, 1/5 hp, cETLus, ENERGY STAR®
2. cord & plug, standard
3. Doors hinged per plan

ITEM #C46 SPARE NO.

ITEM #C47 SPARE NO.

ITEM #C48 SPARE NO.

ITEM #C49 SPARE NO.

ITEM #C50 SERVING COUNTER

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Service counter, see plans and elevations for width, length and configuration.
2. Similar to standard details; FSD7-1, FSD1-7, FSD1-10, and FSD1-23. These standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
3. Basic configuration to be stainless steel base cabinet with décor top and faces, as selected by the Interior Designer. Provide full size 3/4" thick structurally sound substrate on top and faces for mounting décor finish materials, unless otherwise instructed. Refer to fabrication details, counter cladding details and/or Interior Designer's details and specifications for complete instructions on fabrication, dimensions, materials, and installation.
4. Cabinet base with hinged doors with locks .
5. Cabinet base with open shelf.
6. Provide hinged louvered access doors at all compressor locations.
7. Provide sufficient ventilation for compressors, add fan if needed.
8. Provide open shelving with adjustable middle shelf as shown on elevations.
9. Provide 14-gauge " stainless steel removable kick plates per FSD1-23.
10. Counter to be mounted on 6" high, stainless steel legs with adjustable stainless-steel feet.
11. Coordinate cut-outs for all equipment mounted within counter top.
12. Where shown, entire counter to be pre-wired to a built-in circuit breaker panel. This shall include all outlets, J-boxes, conduit, wiring, electrical components, and accessories attached to, or built into the counter. All conduit, with wiring, shall be concealed from view, and installed in a manner that will not interfere with the intended use of the counter. Panel to include a main breaker for single circuit service connection, and individual breakers for items included in the counter. Panel and electrical components and installation shall comply with the National Electrical Code. Verify and coordinate panel service circuit size, load, phasing, and requirements with the Electrical Engineer's documents, and the Electrical Division. Fabrication shop to be NEC approved.
13. Entire counter to be pre-wired to an accessible pull-box. This shall include all outlets, J-boxes, conduit, wiring, electrical components, and accessories attached to, or built into the counter. All conduits, with wiring, shall be concealed from view and installed in a manner, which will not interfere with the intended use of the counter. Electrical components and installation shall comply with the National Electrical Code. Verify and coordinate pull box location with rough-in location. Pigtails shall be tagged with the electrical requirements and identification of the equipment they serve; ready for final connection by the Electrical Division. Refer to detail MEP8-3.
14. KEC to provide faucets where shown. Fabricator to coordinate all penetrations and plumbing line runs within counter assembly within shop.
15. Coordinate cut-outs for all equipment mounted within counter top.
16. Install remote controls on service side of counter
17. Counter, tops, food shields, etc. to be manufactured by NSF, NEC, UL certified fabricator.

18. Counter and food shield to be manufactured by same fabricator to assure proper fit finish and structural integrity.
19. Stone top, die wall and fascia finish specification/selection by Interior Designer, but provided by KEC. Top to be provided as specified by Interior Designer. Support top as required, provide grommets and stainless-steel escutcheons where wiring penetration is required.
20. Cut outs in counter tops for drop-in equipment to have proper heat isolation insulation and framework, see details on counter fabrication drawings.
21. Penetrations in counter top for utilities and supply lines to be complete with grommets - finish per Interior Designer. Penetrations to be field-located and field drilled per Owner/Operator direction.
22. Basic configuration to be construction using stainless steel end panels, 14-gauge galvanized horizontal and vertical structural supports providing integral utility chase concealed by 18-gauge stainless steel, removable back panels. 18-gauge intermediate shelves as required. 16-gauge bottom shelves.
23. Bottom shelf to include removable, flush-with-shelf access panel for floor sink access below as required.
24. 16-gauge stainless steel aprons for equipment controls, where shown.
25. Counter front where tile called for to be tile backer board with tile applied in field by others.
26. KEC and fabricator to field-template counter tops prior to top fabrication and coordinate existing to be refurbished wall conditions that interface counter tops with G.C.
27. Provide required heat removal ventilation for self-contained or remote refrigerated equipment within counter per manufacturer's requirements. Provide additional fans, grating, through-ventilation as required. Coordinate same with Interior Designer.
28. Provide shop-installed refrigeration sleeves through base cabinetry and plan for same as part of shop drawing process. KEC, refrigeration contractor, G.C. plumbing contractor, electrical contractor and fabricator to FIELD-coordinate line-runs, penetrations, sleeving, access hatching, field-connection planning all prior to commencement of counter fabrication. The above shall be evident on submitted shop drawings for all fabricated counters or tabling.

ITEM #C50.1 FOOD SHIELD WITH HEAT AND LIGHTS

Quantity: One (1)
Manufacturer: BSI
Model: ZG9930

Fabricate/Furnish and set-in place per plans, details, and the following:

1. ZGuard® Food Shield, single, self-service, fully adjustable, 20-1/2" height, 14" wide tempered glass top & lower sneeze guard, 1" diameter tubing double supports, cULus.
2. Tubing to be coordinated
3. Frame finish as selected by Architect/I.D.
4. 1" radius corner, standard.
5. Stealth™ Warmer & Light Combo, cULus, NSF.
6. Voltage & Length to be co ordinated.
7. 3000K LED Lamp, cULus, NSF.
8. Remote infinite control.
9. Wiring exit point to be co ordinated
10. Provide shop drawings for review/approval.

ITEM #C50.2 HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)

Manufacturer: Wells (Middleby)
Model: HRCP-7100

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hot/Cold Drop In Unit, 1-pan size, single tank with switch for hot or cold operation with self-contained refrig., automatic water fill, includes (2) pan dividers, R(COLD) 1/4 HP, (HOT) 208/9.0-direct, NSF, cULus

ITEM #C50.3 FOOD SHIELD, VERTICAL

Quantity: Three (3)
Manufacturer: BSI
Model: CV100-2

Fabricate/Furnish and set-in place per plans, details, and the following:

1. BSI, LLC ClearView Food Shield, full-service, 18"D x 26"H, clean seam, UV bonded tempered glass, NSF-Component
2. 1/2" Tempered glass (centerline max 72")
3. Glass Clips (secured to counter)

ITEM #C50.4 MEGA TOP SANDWICH / SALAD PREPARATION REFRIGERATOR

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: SW48N18M

Furnish and set in place per manufacturer's standard specifications and the following:

1. Mighty Top Sandwich Unit, 48"W, 13.4 cu ft capacity, two-section, (18) 1/6 size x 4" deep pans with 8" cutting board, (2) field rehingeable doors, stainless steel top, front & end panels, aluminum back & interior, rear mounted self-contained refrigeration, automatic hot gas condensate evaporator, R290 hydrocarbon refrigerant, 1/4 hp, cETLus, NSF
2. Cord & Plug, Standard
3. Left Door hinged on left & right door hinged on right, standard
4. Casters, 5" standard

ITEM #C50.5 HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: HRCP-7100

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hot/Cold Drop In Unit, 1-pan size, single tank with switch for hot or cold operation with self-contained refrig., automatic water fill, includes (2) pan dividers, R(COLD) 1/4 HP, (HOT) 208/9.0-direct, NSF, cULus

ITEM #C50.6 MEGA TOP SANDWICH / SALAD PREPARATION REFRIGERATOR

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: SW48N18M

Furnish and set in place per manufacturer's standard specifications and the following:

1. Mighty Top Sandwich Unit, 48"W, 13.4 cu ft capacity, two-section, (18) 1/6 size x 4" deep pans with 8" cutting board, (2) field rehingeable doors, stainless steel top, front & end panels, aluminum back & interior, rear mounted self-contained refrigeration, automatic hot gas condensate evaporator, R290 hydrocarbon refrigerant, 1/4 hp, cETLus, NSF
2. Cord & Plug, Standard
3. Left Door hinged on left & right door hinged on right, standard
4. Casters, 5" standard

ITEM #C50.7 FOOD SHIELD WITH HEAT AND LIGHTS

Quantity: One (1)
Manufacturer: BSI
Model: ZG9930

Fabricate/Furnish and set-in place per plans, details, and the following:

1. ZGuard® Food Shield, single, self-service, fully adjustable, 20-1/2" height, 14" wide tempered glass top & lower sneeze guard, 1" diameter tubing double supports, cULus.
2. Tubing to be coordinated
3. Frame finish as selected by Architect/I.D.
4. 1" radius corner, standard.
5. Stealth™ Warmer & Light Combo, cULus, NSF.
6. Voltage & Length to be coordinated.
7. 3000K LED Lamp, cULus, NSF.
8. Remote infinite control.
9. Wiring exit point to be coordinated
10. Provide shop drawings for review/approval.

ITEM #C50.8 MEGA TOP SANDWICH / SALAD PREPARATION REFRIGERATOR

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: SW60N24M

Furnish and set in place per manufacturer's standard specifications and the following:

1. Mighty Top Sandwich Unit, 60"W, 17.0 cu ft capacity, two-section, (24) 1/6 size x 4" deep pans with 8" cutting board, (2) field rehingeable doors, stainless steel top, front & end panels, aluminum back & interior, rear mounted self-contained refrigeration, automatic hot gas condensate evaporator, R290 hydrocarbon refrigerant, 1/3 HP, cETLus, NSF
2. Cord & Plug, standard

3. Left Door hinged on left & right door hinged on right, standard
4. Casters, 5" standard

ITEM #C50.9 FOOD SHIELD, VERTICAL

Quantity: Four (4)
Manufacturer: BSI
Model: CV100-2

Fabricate/Furnish and set-in place per plans, details, and the following:

1. BSI, LLC ClearView Food Shield, full-service, 18"D x 26"H, clean seam, UV bonded tempered glass, NSF-Component
2. 1/2" Tempered glass (centerline max 72")
3. Glass Clips (secured to counter)

ITEM #C50.10 HOT FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: SS-10TDUCIAF

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Food Warmer, top-mount, built-in, electric, for 11 quart round insert, drain, with auto-fill, wet/dry operation, thermostatic control, fully insulated, stainless steel construction, Wellslok, cULus, NSF
2. Cord & Plug, Standard

ITEM #C50.11 HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: HRCP-7100

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hot/Cold Drop In Unit, 1-pan size, single tank with switch for hot or cold operation with self-contained refrig., automatic water fill, includes (2) pan dividers, R(COLD) 1/4 HP, (HOT) 208/9.0-direct, NSF, cULus

ITEM #C50.12 INDUCTION RANGE, BUILT-IN / DROP-IN

Quantity: One (1)
Manufacturer: Spring USA
Model: ICB348-26

Fabricate/Furnish and set-in place per plans, details, and the following:

1. MAX Induction™ Cooking System, built-in, MAX Induction® ranges (SM-261R), (2) induction air filter systems (AF-350), integrated power management system (PM-2221), 20 cook modes, temperature range 100°F to 400°F, individual SmartScan® controls, stainless steel, , ETL, UL-STD 197, NSF-ANSI STD 4, UL-ANSI/NSF No. 2, FCC, cETL (custom product) (6-8 week lead time)

ITEM #C50.13 REFRIGERATED MAKE-UP COUNTER

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: D48N12

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Designer Line Sandwich Unit, 48"W, two-section, (12) 1/6 size x 4" deep pans with 12" cutting board, (2) field rehingeable doors, stainless steel top, front, sides & interior, electronic control with digital display, hi-low alarm, 6" adjustable legs, rear mounted self-contained refrigeration, automatic hot gas condensate evaporator, R290 hydrocarbon refrigerant, 1/4 hp, cETLus, NSF
2. cord, , standard
3. Doors hinged per plan

ITEM #C50.14 HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: HRCP-7100

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hot/Cold Drop In Unit, 1-pan size, single tank with switch for hot or cold operation with self-contained refrig., automatic water fill, includes (2) pan dividers, R(COLD) 1/4 HP, (HOT) 208/9.0-direct, NSF, cULus

ITEM #C50.15 FOOD SHIELD WITH HEAT AND LIGHTS

Quantity: One (1)
Manufacturer: BSI
Model: ZG9930

Fabricate/Furnish and set-in place per plans, details, and the following:

1. ZGuard® Food Shield, single, self-service, fully adjustable, 20-1/2" height, 14" wide tempered glass top & lower sneeze guard, 1" diameter tubing double supports, cULus.
2. Tubing to be coordinated
3. Frame finish as selected by Architect/I.D.
4. 1" radius corner, standard.
5. Stealth™ Warmer & Light Combo, cULus, NSF.
6. Voltage & Length to be coordinated.
7. 3000K LED Lamp, cULus, NSF.
8. Remote infinite control.

9. Wiring exit point to be coordinated
10. Provide shop drawings for review/approval.

ITEM #C50.16 FOOD SHIELD WITH HEAT AND LIGHTS

Quantity: One (1)
Manufacturer: BSI
Model: ZG9930

Fabricate/Furnish and set-in place per plans, details, and the following:

1. ZGuard® Food Shield, single, self-service, fully adjustable, 20-1/2" height, 14" wide tempered glass top & lower sneeze guard, 1" diameter tubing double supports, cULus.
2. Tubing to be coordinated
3. Frame finish as selected by Architect/I.D.
4. 1" radius corner, standard.
5. Stealth™ Warmer & Light Combo, cULus, NSF.
6. Voltage & Length to be coordinated.
7. 3000K LED Lamp, cULus, NSF.
8. Remote infinite control.
9. Wiring exit point to be coordinated
10. Provide shop drawings for review/approval.

ITEM #C50.17 REFRIGERATED MAKE-UP COUNTER

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: D48N12

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Designer Line Sandwich Unit, 48"W, two-section, (12) 1/6 size x 4" deep pans with 12" cutting board, (2) field rehingeable doors, stainless steel top, front, sides & interior, electronic control with digital display, hi-low alarm, 6" adjustable legs, rear mounted self-contained refrigeration, automatic hot gas condensate evaporator, R290 hydrocarbon refrigerant, 1/4 hp, cETLus, NSF
2. cord, , standard
3. Doors hinged per plan

ITEM #C50.18 FOOD SHIELD, VERTICAL

Quantity: Five (5)
Manufacturer: BSI
Model: CV100-2

Fabricate/Furnish and set-in place per plans, details, and the following:

1. BSI, LLC ClearView Food Shield, full-service, 18"D x 26"H, clean seam, UV bonded tempered glass, NSF-Component
2. 1/2" Tempered glass (centerline max 72")
3. Glass Clips (secured to counter)

ITEM #C50.19 FOOD SHIELD WITH HEAT AND LIGHTS

Quantity: One (1)
Manufacturer: BSI
Model: ZG9930

Fabricate/Furnish and set-in place per plans, details, and the following:

1. ZGuard® Food Shield, single, self-service, fully adjustable, 20-1/2" height, 14" wide tempered glass top & lower sneeze guard, 1" diameter tubing double supports, cULus.
2. Tubing to be coordinated
3. Frame finish as selected by Architect/I.D.
4. 1" radius corner, standard.
5. Stealth™ Warmer & Light Combo, cULus, NSF.
6. Voltage & Length to be coordinated.
7. 3000K LED Lamp, cULus, NSF.
8. Remote infinite control.
9. Wiring exit point to be coordinated
10. Provide shop drawings for review/approval.

ITEM #C50.20 HOT FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: SS-10TDUCIAF

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Food Warmer, top-mount, built-in, electric, for 11-quart round insert, drain, with autofill, wet/dry operation, thermostatic control, fully insulated, stainless steel construction, Wellslok, cULus, NSF
2. Cord & Plug, Standard

ITEM #C50.21 HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: HRCP-7100

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hot/Cold Drop In Unit, 1-pan size, single tank with switch for hot or cold operation with self-contained refrig., automatic water fill, includes (2) pan dividers, R(COLD) 1/4 HP, (HOT) 208/9.0-direct, NSF, cULus

ITEM #C50.22 REFRIGERATED MAKE-UP COUNTER

Quantity: One (1)

Manufacturer: Continental Refrigerator
Model: D48N12

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Designer Line Sandwich Unit, 48"W, two-section, (12) 1/6 size x 4" deep pans with 12" cutting board, (2) field rehingeable doors, stainless steel top, front, sides & interior, electronic control with digital display, hi-low alarm, 6" adjustable legs, rear mounted self-contained refrigeration, automatic hot gas condensate evaporator, R290 hydrocarbon refrigerant, 1/4 hp, cETLus, NSF
2. Cord & Plug, standard
3. Doors hinged per plan

ITEM #C50.23 FOOD SHIELD, VERTICAL

Quantity: Two (2)
Manufacturer: BSI
Model: CV100-2

Fabricate/Furnish and set-in place per plans, details, and the following:

1. BSI, LLC ClearView Food Shield, full-service, 18"D x 26"H, clean seam, UV bonded tempered glass, NSF-Component
2. 1/2" Tempered glass (centerline max 72")
3. Glass Clips (secured to counter)

ITEM #C50.24 INDUCTION RANGE, BUILT-IN / DROP-IN

Quantity: One (1)
Manufacturer: Spring USA
Model: ICB348-26

Fabricate/Furnish and set-in place per plans, details, and the following:

1. MAX Induction™ Cooking System, built-in, MAX Induction® ranges (SM-261R), (2) induction air filter systems (AF-350), integrated power management system (PM-2221), 20 cook modes, temperature range 100°F to 400°F, individual SmartScan® controls, stainless steel, , ETL, UL-STD 197, NSF-ANSI STD 4, UL-ANSI/NSF No. 2, FCC, cETL (custom product) (6-8 week lead time)

ITEM #C50.25 LOAD CENTER

ITEM #C51 CARVING STATION

Quantity: One (1)
Manufacturer: Alto-Shaam
Model: CS-200/S

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hot Carving Shelf, 33" x 25-3/4" x 30-15/16", indicator light, infrared lamp, (3) position HI/LOW/OFF toggle switch, cutting board, 70 lb. max capacity, recessed surface, framed clear glass breath guard, 1" legs, 18 gauge stainless steel construction, EcoSmart®, cULus, NSF, CE, EAC
2. Cord & Plug, standard

ITEM #C52 SPARE NO.

ITEM #C53 SPARE NO.

ITEM #C54 SPARE NO.

ITEM #C55 SPARE NO.

ITEM #C56 SPARE NO.

ITEM #C57 SPARE NO.

ITEM #C58 DESSERT COUNTER

Quantity: One (1)
Manufacturer: Fabricated
Model: Custom

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Service counter, see plans and elevations for width, length and configuration.
2. Similar to standard details; FSD7-1, FSD1-7, FSD1-10, and FSD1-23. These standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
3. Basic configuration to be stainless steel base cabinet with décor top and faces, as selected by the Interior Designer. Provide full size 3/4" thick structurally sound substrate on top and faces for mounting décor finish materials, unless otherwise instructed. Refer to fabrication details, counter cladding details and/or Interior Designer’s details and specifications for complete instructions on fabrication, dimensions, materials, and installation.
4. Cabinet base with hinged doors with locks .
5. Cabinet base with open shelf.
6. Provide hinged louvered access doors at all compressor locations.
7. Provide sufficient ventilation for compressors, add fan if needed.
8. Provide open shelving with adjustable middle shelf as shown on elevations.
9. Provide 14-gauge " stainless steel removable kick plates per FSD1-23.
10. Counter to be mounted on 6” high, stainless steel legs with adjustable stainless-steel feet.
11. Coordinate cut-outs for all equipment mounted within counter top.
    Install remote controls on service side of counter
12. Counter, tops, food shields, etc. to be manufactured by NSF, NEC, UL certified fabricator.

13. Counter and food shield to be manufactured by same fabricator to assure proper fit finish and structural integrity.
14. Stone top, die wall and fascia finish specification/selection by Interior Designer, but provided by KEC. Top to be provided as specified by Interior Designer. Support top as required, provide grommets and stainless-steel escutcheons where wiring penetration is required.
15. Cut outs in counter tops for drop-in equipment to have proper heat isolation insulation and framework, see details on counter fabrication drawings.
16. Penetrations in counter top for utilities and supply lines to be complete with grommets - finish per Interior Designer. Penetrations to be field-located and field drilled per Owner/Operator direction.
17. Basic configuration to be construction using stainless steel end panels, 14-gauge galvanized horizontal and vertical structural supports providing integral utility chase concealed by 18-gauge stainless steel, removable back panels. 18-gauge intermediate shelves as required. 16-gauge bottom shelves.
18. Bottom shelf to include removable, flush-with-shelf access panel for floor sink access below as required.
19. 16-gauge stainless steel aprons for equipment controls, where shown.
20. Counter front where tile called for to be tile backer board with tile applied in field by others.
21. KEC and fabricator to field-template counter tops prior to top fabrication and coordinate existing to be refurbished wall conditions that interface counter tops with G.C.
22. Provide required heat removal ventilation for self-contained or remote refrigerated equipment within counter per manufacturer's requirements. Provide additional fans, grating, through-ventilation as required. Coordinate same with Interior Designer.

ITEM #C58.1 COLD FOOD WELL UNIT, DROP-IN, REFRIGERATED

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: RCP-7300

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Cold Food Well Unit, drop-in, self-contained refrigeration, (3) 12" x 20" pan capacity, on/off switch with individual thermostatic controls, insulated pan, 3" recessed top edge, 1" drain, stainless steel inner liner, top & flange, steel exterior body, R-refrigerant, 1/3 HP, , NSF, cULus

ITEM #C58.2 FOOD SHIELD WITH LIGHTS

Quantity: One (1)
Manufacturer: BSI
Model: ZG9930

Fabricate/Furnish and set-in place per plans, details, and the following:

1. ZGuard® Food Shield, single, self-service, fully adjustable, 20-1/2" height, 14" wide tempered glass top & lower sneeze guard, 1" diameter tubing double supports, cULus.
2. Tubing to be coordinated
3. Frame finish as selected by Architect/I.D.
4. 1" radius corner, standard.
5. Stealth™ Warmer & Light Combo, cULus, NSF.
6. Voltage & Length to be coordinated.
7. 3000K LED Lamp, cULus, NSF.

8. Remote infinite control.
9. Wiring exit point to be co ordinated
10. Provide shop drawings for review/approval.

ITEM #C58.3 FOOD SHIELD WITH LIGHTS

Quantity: One (1)
Manufacturer: BSI
Model: ZG9930

Fabricate/Furnish and set-in place per plans, details, and the following:

1. ZGuard® Food Shield, single, self-service, fully adjustable, 20-1/2" height, 14" wide tempered glass top & lower sneeze guard, 1" diameter tubing double supports, cULus.
2. Tubing to be coordinated
3. Frame finish as selected by Architect/I.D.
4. 1" radius corner, standard.
5. Stealth™ Warmer & Light Combo, cULus, NSF.
6. Voltage & Length to be coordinated.
7. 3000K LED Lamp, cULus, NSF.
8. Remote infinite control.
9. Wiring exit point to be coordinated
10. Provide shop drawings for review/approval.

ITEM #C58.4 HOT FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: Two (2)
Manufacturer: Wells (Middleby)
Model: SS-10TDUCIAF

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Food Warmer, top-mount, built-in, electric, for 11-quart round insert, drain, with auto-fill, wet/dry operation, thermostatic control, fully insulated, stainless steel construction, Wellslok, cULus, NSF
2 Cord & Plug, Standard

ITEM #C58.5 COLD FOOD WELL UNIT, DROP-IN, REFRIGERATED

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: RCP-7100

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Cold Food Well Unit, drop-in, self-contained refrigeration, (1) 12" x 20" pan capacity, on/off switch with thermostatic controls, insulated pan, 3" recessed top edge, 1" drain, stainless steel inner liner, top & flange, steel exterior body, R-refrigerant, 1/4 HP, , NSF, cULus

ITEM #C58.6 COLD SHELF

Quantity: One (1)
Manufacturer: Hatco
Model: CSBF-36-F

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Cold Shelf, built-in flush top, 36"W x 15-1/2"D, electronic temperature control, condensing unit, aluminum hardcoat, top mount, 1/5 HP, cULus, Made in USA
2. 1/5 HP, (domestic voltage), standard

ITEM #C58.7 FOOD SHIELD WITH LIGHTS

Quantity: One (1)
Manufacturer: BSI
Model: ZG9930

Fabricate/Furnish and set-in place per plans, details, and the following:

1. ZGuard® Food Shield, single, self-service, fully adjustable, 20-1/2" height, 14" wide tempered glass top & lower sneeze guard, 1" diameter tubing double supports, cULus.
2. Tubing to be coordinated
3. Frame finish as selected by Architect/I.D.
4. 1" radius corner, standard.
5. Stealth™ Warmer & Light Combo, cULus, NSF.
6. Voltage & Length to be co ordinated.
7. 3000K LED Lamp, cULus, NSF.
8. Remote infinite control.
9. Wiring exit point to be co ordinated
10. Provide shop drawings for review/approval.

ITEM #C59 UNDERCOUNTER FREEZER

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: DF27N-U

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Designer Line Undercounter Freezer, 27"W, one-section, (1) field rehingeable door, stainless steel exterior & interior, stainless steel top, 1-3/8" diameter plate casters, front breathing, electronic control with digital display, hi-low alarm, rear mounted self-contained refrigeration, R290 hydrocarbon refrigerant, 1/4 HP, cETLus, NSF
2. Cord & Plug, standard
3. Door hinged per plan

ITEM #C60 WAFFLE MAKER / BAKER

Quantity: One (1)

Manufacturer: Waring
Model: WW200

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Belgian Waffle Maker, double, up to (50) 7" diameter, 1" thick waffles per hour, audio beep signal, vertical design & rotary feature, power & ready-to-bake LED indicators, embedded heating element, non-stick plates, heavy duty die cast housing, cord & plug, cETLus, NSF

ITEM #C61 POP-UP TOASTER

Quantity: One (1)
Manufacturer: Waring
Model: WCT702

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Commercial Toaster, (2) 1-3/8" wide slots, (2) slice capacity, extra-high lift control, rotary dial to adjust browning controls, defrost button, reheat button, cancel button, pull-out crumb tray, mirror chrome-plated finish, 3 ft. cord with 3-prong plug, UL, cUL, NSF

ITEM #C62 MILK DISPENSER

Quantity: One (1)
Manufacturer: Silver King
Model: SKMAJ3-ESUS4

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Majestic Series Milk Dispenser, refrigerated, triple valve-spring loaded, 18 gallon capacity, (accommodates 3, 5, or 6 gallon bags), includes (3) crates, stainless steel interior & exterior with galvanized bottom, bottom-mounted self-contained refrigeration, R290 Hydrocarbon refrigerant, 1/6 HP,, cETLus, ETL-Sanitation

ITEM #C63 DISPENSER, DRY PRODUCTS

Quantity: Three (3)
Manufacturer: Cal-Mil
Model: 718

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Elite Portion Control Cereal Dispenser, (3) 9.8L capacity bins, 17" x 13-1/2 x 22"H, clear, metal base and lids (shipped in 2 boxes) (UPS Oversize 1), BPA Free

ITEM #C64 SPARE NO.

ITEM #C65 SPARE NO.

ITEM #C66 SPARE NO.

ITEM #C67 SPARE NO.

ITEM #C68 SPARE NO.

ITEM #C69 BEVERAGE COUNTER

Quantity: One (1)
Manufacturer: Fabricated
Model: Custom

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Service counter, see plans and elevations for width, length and configuration.
2. Similar to standard details; FSD7-1, FSD1-7, FSD1-10, and FSD1-23. These standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
3. Basic configuration to be stainless steel base cabinet with décor top and faces, as selected by the Interior Designer. Provide full size 3/4" thick structurally sound substrate on top and faces for mounting décor finish materials, unless otherwise instructed. Refer to fabrication details, counter cladding details and/or Interior Designer's details and specifications for complete instructions on fabrication, dimensions, materials, and installation.
4. Cabinet base with hinged doors with locks .
5. Cabinet base with open shelf.
6. Provide hinged louvered access doors at all compressor locations.
7. Provide sufficient ventilation for compressors, add fan if needed.
8. Provide open shelving with adjustable middle shelf as shown on elevations.
9. Provide 14-gauge " stainless steel removable kick plates per FSD1-23.
10. Counter to be mounted on 6" high, stainless steel legs with adjustable stainless-steel feet.
11. Coordinate cut-outs for all equipment mounted within counter top.
    Install remote controls on service side of counter
12. Counter, tops, food shields, etc. to be manufactured by NSF, NEC, UL certified fabricator.
13. Counter and food shield to be manufactured by same fabricator to assure proper fit finish and structural integrity.
14. Stone top, die wall and fascia finish specification/selection by Interior Designer, but provided by KEC. Top to be provided as specified by Interior Designer. Support top as required, provide grommets and stainless-steel escutcheons where wiring penetration is required.
15. Cut outs in counter tops for drop-in equipment to have proper heat isolation insulation and framework, see details on counter fabrication drawings.
16. Penetrations in counter top for utilities and supply lines to be complete with grommets - finish per Interior Designer. Penetrations to be field-located and field drilled per Owner/Operator direction.
17. Basic configuration to be construction using stainless steel end panels, 14-gauge galvanized horizontal and vertical structural supports providing integral utility chase concealed by 18-gauge stainless steel, removable back panels. 18-gauge intermediate shelves as required. 16-gauge bottom shelves.

18. Bottom shelf to include removable, flush-with-shelf access panel for floor sink access below as required.
19. 16-gauge stainless steel aprons for equipment controls, where shown.
20. Counter front where tile called for to be tile backer board with tile applied in field by others.
21. KEC and fabricator to field-template counter tops prior to top fabrication and coordinate existing to be refurbished wall conditions that interface counter tops with G.C.
22. Provide required heat removal ventilation for self-contained or remote refrigerated equipment within counter per manufacturer's requirements. Provide additional fans, grating, through-ventilation as required. Coordinate same with Interior Designer.

ITEM #C69.1 FOOD SHIELD WITH LIGHTS

Quantity: One (1)
Manufacturer: BSI
Model: ZG9930

Fabricate/Furnish and set-in place per plans, details, and the following:

1. ZGuard® Food Shield, single, self-service, fully adjustable, 20-1/2" height, 14" wide tempered glass top & lower sneeze guard, 1" diameter tubing double supports, cULus.
2. Tubing to be coordinated
3. Frame finish as selected by Architect/I.D.
4. 1" radius corner, standard.
5. Stealth™ Warmer & Light Combo, cULus, NSF.
6. Voltage & Length to be coordinated.
7. 3000K LED Lamp, cULus, NSF.
8. Remote infinite control.
9. Wiring exit point to be coordinated
10. Provide shop drawings for review/approval.

ITEM #C70 WATER DISPENSER

Quantity: One (1)
Manufacturer: Vivreau Advanced Water Systems
Model: VI-TAP-2H

Fabricate/Furnish and set-in place per plans, details, and the following:

1. (1032431) Vivreau Water Dispensing System, single tap, fully-integrated under counter, micro-filtered, chilled still & sparkling drinking water, 11 liters/hour flow for instant hot water, touch control dispenser with hot water safety feature, cooler/carbonator, water filter, Mavea descaling filter, zero splash, anti-flood detection, removable dispense nozzle, component format, ETL, NSF.
2. Annual Maintenance Program, includes: (2) filter changes per year, routine maintenance, reactive service, (1) year warranty on parts & service, training materials, marketing & promotional services.

ITEM #C70.1 20LB CO2 TANK; QTY: 1, N.I.K.E.C - BY PURVEYOR

ITEM #C70.2 WATER FILTRATION SYSTEM, PARTS & ACCESSORIES

Quantity: One (1)
Manufacturer: Everpure
Model: EV929322

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Coldrink/Insurice Water Filtration Manifold, Coldrink/Insurice Twin, (1) EC210 prefilter, (1) Coldrink/Insurice Twin Manifold, mounting bracket, built-in water shut-off valve, outlet pressure gauge, 3/4" inlet, 3/4" outlet (EV929322)

ITEM #C71 BEVERAGE DISPENSER, ELECTRIC (COLD)

Quantity: Two (2)
Manufacturer: Grindmaster-UNIC-Crathco
Model: CS-3L-16-290

Fabricate/Furnish and set-in place per plans, details, and the following:

1. GRINDMASTER Beverage - Crathco® Simplicity® Bubbler® Pre-Mix Cold Beverage Dispenser, electric, triple agitator tall model, (3) 4.75 gallon clear plastic bowls, 35° to 41°F temperature range, 9" cup clearance, stainless steel base, 4" legs, 1/10 HP, , cULus, NSF, R290 refrigerant
2. 2" clearance required on sides, 5" clearance required at rear
3. GRINDMASTER Beverage - (LV0GM1FH) Preventative Maintenance Kit, 6-month schedule, for CS-3L-16, Simplicity® Bubbler® Triple Tall agitator model
4. GRINDMASTER Beverage - (LV9R0172) Crathco® Cleaning Kit, for Bubbler®, includes: (1) 16" soft bristled brush, (1) gallon jug for mixing, box of (50) 1 oz. cleaning packets & laminated recommended procedures

ITEM #C72 GLASS RACK DOLLY

Quantity: One (1)
Manufacturer: Cres Cor
Model: 5002020

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Dish Rack Dolly, platform design, single stack, designed for 20" x 20" racks, all aluminum construction, (4) 5" swivel casters (2) braked

ITEM #C73 SPARE NO.

ITEM #C74 SPARE NO.

ITEM #C75 SPARE NO.

ITEM #C76 SPARE NO.

ITEM #C77 BEVERAGE COUNTER W/ SINK

Quantity: One (1)
Manufacturer: Fabricated
Model: Custom

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Service counter, see plans and elevations for width, length and configuration.
2. Similar to standard details; FSD7-1, FSD1-7, FSD1-10, and FSD1-23. These standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
3. Basic configuration to be stainless steel base cabinet with décor top and faces, as selected by the Interior Designer. Provide full size 3/4" thick structurally sound substrate on top and faces for mounting décor finish materials, unless otherwise instructed. Refer to fabrication details, counter cladding details and/or Interior Designer's details and specifications for complete instructions on fabrication, dimensions, materials, and installation.
4. Cabinet base with hinged doors with locks .
5. Cabinet base with open shelf.
6. Provide hinged louvered access doors at all compressor locations.
7. Provide sufficient ventilation for compressors, add fan if needed.
8. Provide open shelving with adjustable middle shelf as shown on elevations.
9. Provide 14-gauge " stainless steel removable kick plates per FSD1-23.
10. Counter to be mounted on 6" high, stainless steel legs with adjustable stainless-steel feet.
11. Coordinate cut-outs for all equipment mounted within counter top.
    Install remote controls on service side of counter
12. Counter, tops, food shields, etc. to be manufactured by NSF, NEC, UL certified fabricator.
13. Counter and food shield to be manufactured by same fabricator to assure proper fit finish and structural integrity.
14. Stone top, die wall and fascia finish specification/selection by Interior Designer, but provided by KEC. Top to be provided as specified by Interior Designer. Support top as required, provide grommets and stainless-steel escutcheons where wiring penetration is required.
15. Cut outs in counter tops for drop-in equipment to have proper heat isolation insulation and framework, see details on counter fabrication drawings.
16. Penetrations in counter top for utilities and supply lines to be complete with grommets - finish per Interior Designer. Penetrations to be field-located and field drilled per Owner/Operator direction.
17. Basic configuration to be construction using stainless steel end panels, 14-gauge galvanized horizontal and vertical structural supports providing integral utility chase concealed by 18-gauge stainless steel, removable back panels. 18-gauge intermediate shelves as required. 16-gauge bottom shelves.
18. Bottom shelf to include removable, flush-with-shelf access panel for floor sink access below as required.
19. 16-gauge stainless steel aprons for equipment controls, where shown.
20. Counter front where tile called for to be tile backer board with tile applied in field by others.
21. KEC and fabricator to field-template counter tops prior to top fabrication and coordinate existing to be refurbished wall conditions that interface counter tops with G.C.

22. Provide required heat removal ventilation for self-contained or remote refrigerated equipment within counter per manufacturer's requirements. Provide additional fans, grating, through-ventilation as required. Coordinate same with Interior Designer.

ITEM #C78 COFFEE BREWER

Quantity: One (1)
Manufacturer: FETCO
Model: CBS-52H-20 (C53016)

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Handle Operated Series Coffee Brewer, twin, 2.0 gallon capacity, automatic, on/off switch, two-portion standard, gravity flow dispense tube system, programmable recipes, gourmet coffee brew basket locks during brew cycle, hot water service, tank drain, 2 x heaters, 120/208-240v, 1-ph, 3+G wires, 22.0 - 25.4 max amp draw, 4.6 - terminal block, 4.0 - 20.0 gallons per hour, UL, cUL, NSF (Use with FETCO D450 or D453 - sold separately)

ITEM #C79 COFFEE BREWER

Quantity: One (1)
Manufacturer: FETCO
Model: CBS-51H-15 (C51016)

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Handle Operated Series Coffee Brewer, single, 1.5 gallon capacity, automatic, on/off switch, two-portion standard, gravity flow dispense tube system, programmable recipes, gourmet coffee brew basket locks during brew cycle, hot water service, tank drain, 1 x heater, 2+G wires, 15.8 max amp draw, terminal block, 4.5 gallons per hour, UL, cUL, NSF (Use with FETCO D449, D452, or D009 - sold separately)

ITEM #C80 MILK DISPENSER

Quantity: Two (2)
Manufacturer: Silver King
Model: SKMAJ1-ESUS4

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Majestic Series Milk Dispenser, refrigerated, single valve- spring loaded , 6 gallon capacity, (accommodates 3, 5, or 6 gallon bags), includes (1) crate, stainless steel interior & exterior with galvanized bottom, bottom-mounted self-contained refrigeration, R290 Hydrocarbon refrigerant, 1/10 HP, , cETLus, ETL-Sanitation

ITEM #C81 TRASH RECEPTACLE, 23 GALLON; QTY: 2, N.I.K.E.C.- BY OWNER/OPERATOR

ITEM #C82 CONDIMENT BIN

Quantity: Six (6)
Manufacturer: Metro
Model: SB91055CAS

ITEM #C83 SODA/ICE DISPENSER; QTY: 1, N.I.K.E.C.- BY PURVEYOR

ITEM #C83.1 ICE MAKER, CUBE-STYLE

Quantity: One (1)
Manufacturer: Hoshizaki
Model: KM-1100MAJ

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Ice Maker, Cube-Style, 30"W, air-cooled, self-contained condenser, production capacity up to 1087 lb/24 hours at 70°/50° (935 lb AHRI certified at 90°/70°), stainless steel finish, crescent cube style, R-refrigerant, NSF, UL

ITEM #C83.2 SODA SYSTEM CONDUIT - EXIT; QTY: 1, N.I.K.E.C.- BY ELECTRICAL DIVISION

Quantity: One (1)
Manufacturer: Fabricated
Model: RDS MEP3-1

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Beverage conduit details to be similar to standard detail MEP3-1. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.

ITEM #C84 GLASS RACK DOLLY

Quantity: One (1)
Manufacturer: Cres Cor
Model: 5002020

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Dish Rack Dolly, platform design, single stack, designed for 20" x 20" racks, all aluminum construction, (4) 5" swivel casters (2) braked

ITEM #C85 SPARE NO.

ITEM #C86 SPARE NO.

ITEM #C87 SPARE NO.

ITEM #C88 SPARE NO.

ITEM #C89 SERVING COUNTER

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Service counter, see plans and elevations for width, length and configuration.
2. Similar to standard details; FSD7-1, FSD1-7, FSD1-10, and FSD1-23. These standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
3. Basic configuration to be stainless steel base cabinet with décor top and faces, as selected by the Interior Designer. Provide full size 3/4" thick structurally sound substrate on top and faces for mounting décor finish materials, unless otherwise instructed. Refer to fabrication details, counter cladding details and/or Interior Designer's details and specifications for complete instructions on fabrication, dimensions, materials, and installation.
4. Cabinet base with hinged doors with locks.
5. Cabinet base with open shelf.
6. Provide hinged louvered access doors at all compressor locations.
7. Provide sufficient ventilation for compressors, add fan if needed.
8. Provide open shelving with adjustable middle shelf as shown on elevations.
9. Provide 14-gauge " stainless steel removable kick plates per FSD1-23.
10. Counter to be mounted on 6" high, stainless steel legs with adjustable stainless-steel feet.
11. Coordinate cut-outs for all equipment mounted within counter top.
12. Where shown, entire counter to be pre-wired to a built-in circuit breaker panel. This shall include all outlets, J-boxes, conduit, wiring, electrical components, and accessories attached to, or built into the counter. All conduit, with wiring, shall be concealed from view, and installed in a manner that will not interfere with the intended use of the counter. Panel to include a main breaker for single circuit service connection, and individual breakers for items included in the counter. Panel and electrical components and installation shall comply with the National Electrical Code. Verify and coordinate panel service circuit size, load, phasing, and requirements with the Electrical Engineer's documents, and the Electrical Division. Fabrication shop to be NEC approved.
13. Entire counter to be pre-wired to an accessible pull-box. This shall include all outlets, J-boxes, conduit, wiring, electrical components, and accessories attached to, or built into the counter. All conduits, with wiring, shall be concealed from view and installed in a manner, which will not interfere with the intended use of the counter. Electrical components and installation shall comply with the National Electrical Code. Verify and coordinate pull box location with rough-in location. Pigtails shall be tagged with the electrical requirements and identification of the equipment they serve; ready for final connection by the Electrical Division. Refer to detail MEP8-3.
14. Coordinate cut-outs for all equipment mounted within counter top.
15. Install remote controls on service side of counter

16. Counter, tops, food shields, etc. to be manufactured by NSF, NEC, UL certified fabricator.
17. Counter and food shield to be manufactured by same fabricator to assure proper fit finish and structural integrity.
18. Stone top, die wall and fascia finish specification/selection by Interior Designer, but provided by KEC. Top to be provided as specified by Interior Designer. Support top as required, provide grommets and stainless-steel escutcheons where wiring penetration is required.
19. Cut outs in counter tops for drop-in equipment to have proper heat isolation insulation and framework, see details on counter fabrication drawings.
20. Penetrations in counter top for utilities and supply lines to be complete with grommets - finish per Interior Designer. Penetrations to be field-located and field drilled per Owner/Operator direction.
21. Basic configuration to be construction using stainless steel end panels, 14-gauge galvanized horizontal and vertical structural supports providing integral utility chase concealed by 18-gauge stainless steel, removable back panels. 18-gauge intermediate shelves as required. 16-gauge bottom shelves.
22. Bottom shelf to include removable, flush-with-shelf access panel for floor sink access below as required.
23. 16-gauge stainless steel aprons for equipment controls, where shown.
24. Counter front where tile called for to be tile backer board with tile applied in field by others.
25. Cash drawers to be field-mounted and fully coordinated in shop.
26. KEC to field-coordinate drop heat lamp rough-ins with counters below and utilize field templates for same.
27. KEC and fabricator to field-template counter tops prior to top fabrication and coordinate existing to be refurbished wall conditions that interface counter tops with G.C.
28. Provide required heat removal ventilation for self-contained or remote refrigerated equipment within counter per manufacturer's requirements. Provide additional fans, grating, through-ventilation as required. Coordinate same with Interior Designer.
29. Provide shop-installed refrigeration sleeves through base cabinetry and plan for same as part of shop drawing process. KEC, refrigeration contractor, G.C. plumbing contractor, electrical contractor and fabricator to FIELD-coordinate line-runs, penetrations, sleeving, access hatching, field-connection planning all prior to commencement of counter fabrication. The above shall be evident on submitted shop drawings for all fabricated counters or tabling.

ITEM #C89.1 FOOD SHIELD WITH HEAT AND LIGHTS

Quantity: One (1)
Manufacturer: BSI
Model: ZG9930

Fabricate/Furnish and set-in place per plans, details, and the following:

1. ZGuard® Food Shield, single, self-service, fully adjustable, 20-1/2" height, 14" wide tempered glass top & lower sneeze guard, 1" diameter tubing double supports, cULus.
2. Tubing to be coordinated
3. Frame finish as selected by Architect/I.D.
4. 1" radius corner, standard.
5. Stealth™ Warmer & Light Combo, cULus, NSF.
6. Voltage & Length to be coordinated.
7. 3000K LED Lamp, cULus, NSF.
8. Remote infinite control.
9. Wiring exit point to be coordinated
10. Provide shop drawings for review/approval.

ITEM #C89.2 HOT FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: SS-10TDUCIAF

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Food Warmer, top-mount, built-in, electric, for 11-quart round insert, drain, with auto-fill, wet/dry operation, thermostatic control, fully insulated, stainless steel construction, Wellslok, cULus, NSF
2. Cord & Plug, Standard

ITEM #C89.3 FOOD SHIELD, VERTICAL

Quantity: Two (2)
Manufacturer: BSI
Model: CV100-2

Fabricate/Furnish and set-in place per plans, details, and the following:

1. BSI, LLC ClearView Food Shield, full-service, 18"D x 26"H, clean seam, UV bonded tempered glass, NSF-Component
2. 1/2" Tempered glass (centerline max 72")
3. Glass Clips (secured to counter)

ITEM #C89.4 HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: HRCP-7300

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hot/Cold Drop In Unit, 3-pan size, single tank with switch for hot or cold operation with self-contained refrig., automatic water fill, includes (2) pan dividers, R(COLD) 1/3 HP, (HOT) 208/14.4-direct, NSF, cULus

ITEM #C89.5 HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: HRCP-7300

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hot/Cold Drop In Unit, 3-pan size, single tank with switch for hot or cold operation with self-contained refrig., automatic water fill, includes (2) pan dividers, R(COLD) 1/3 HP, (HOT) 208/14.4-direct, NSF, cULus

ITEM #C89.6 SPARE NO.

ITEM #C89.7 SPARE NO.

ITEM #C89.8 MEGA TOP SANDWICH / SALAD PREPARATION REFRIGERATOR

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: SW48N18M

Furnish and set in place per manufacturer's standard specifications and the following:

1. Mighty Top Sandwich Unit, 48"W, 13.4 cu ft capacity, two-section, (18) 1/6 size x 4" deep pans with 8" cutting board, (2) field rehingeable doors, stainless steel top, front & end panels, aluminum back & interior, rear mounted self-contained refrigeration, automatic hot gas condensate evaporator, R290 hydrocarbon refrigerant, 1/4 hp, cETLus, NSF
2. Cord & Plug, standard
3. Left Door hinged on left & right door hinged on right, standard
4. Casters, 5" standard

ITEM #C89.9 HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: HRCP-7300

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hot/Cold Drop In Unit, 3-pan size, single tank with switch for hot or cold operation with self-contained refrig., automatic water fill, includes (2) pan dividers, R(COLD) 1/3 HP, (HOT) 208/14.4-direct, NSF, cULus

ITEM #C89.10 SPARE NO.

ITEM #C89.11 SPARE NO.

ITEM #C89.12 FOOD SHIELD WITH HEAT AND LIGHTS

Quantity: One (1)
Manufacturer: BSI
Model: ZG9930

Fabricate/Furnish and set-in place per plans, details, and the following:

1. ZGuard® Food Shield, single, self service, fully adjustable, 20-1/2" height, 14" wide tempered glass top & lower sneeze guard, 1" diameter tubing double supports, cULus.
2. Tubing to be specified (NOTE: aluminum may be used only on above counter mounts)
3. Frame finish as selected by Architect/I.D.
4. 1" radius corner, standard.
5. Stealth™ Warmer & Light Combo, cULus, NSF.
6. Voltage & Length to be Coordinated
7. 3000K LED Lamp, cULus, NSF.
8. Remote infinite control.
9. Wiring exit point to coordinated
10. Provide shop drawings for review/approval.

ITEM #C89.13 HOT FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: SS-10TDUCIAF

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Food Warmer, top-mount, built-in, electric, for 11-quart round insert, drain, with auto-fill, wet/dry operation, thermostatic control, fully insulated, stainless steel construction, Wellslok, cULus, NSF
2. Note: Must specify voltage and phase
3. Cord & Plug, Standard

ITEM #C89.14 FOOD SHIELD, VERTICAL

Quantity: Five (5)
Manufacturer: BSI
Model: CV100-2

Fabricate/Furnish and set-in place per plans, details, and the following:

1. BSI, LLC ClearView Food Shield, full-service, 18"D x 26"H, clean seam, UV bonded tempered glass, NSF-Component
2. 1/2" Tempered glass (centerline max 72")
3. Glass Clips (secured to counter)

ITEM #C89.15 HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: HRCP-7100

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hot/Cold Drop In Unit, 1-pan size, single tank with switch for hot or cold operation with self-contained refrig., automatic water fill, includes (2) pan dividers, R(COLD) 1/4 HP, (HOT) 208/9.0-direct, NSF, cULus

ITEM #C89.16 HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: HRCP-7300

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hot/Cold Drop In Unit, 3-pan size, single tank with switch for hot or cold operation with self-contained refrig., automatic water fill, includes (2) pan dividers, R(COLD) 1/3 HP, (HOT) 208/14.4-direct, NSF, cULus

ITEM #C89.17 HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: HRCP-7100

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hot/Cold Drop In Unit, 1-pan size, single tank with switch for hot or cold operation with self-contained refrig., automatic water fill, includes (2) pan dividers, R(COLD) 1/4 HP, (HOT) 208/9.0-direct, NSF, cULus

ITEM #C89.18 HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: HRCP-7300

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hot/Cold Drop In Unit, 3-pan size, single tank with switch for hot or cold operation with self-contained refrig., automatic water fill, includes (2) pan dividers, R(COLD) 1/3 HP, (HOT) 208/14.4-direct, NSF, cULus

ITEM #C89.19 SPARE NO.

ITEM #C89.20 SPARE NO.

ITEM #C89.21 HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: HRCP-7300

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hot/Cold Drop In Unit, 3-pan size, single tank with switch for hot or cold operation with self-contained refrig., automatic water fill, includes (2) pan dividers, R(COLD) 1/3 HP, (HOT) 208/14.4-direct, NSF, cULus

ITEM #C89.9 MEGA TOP SANDWICH / SALAD PREPARATION REFRIGERATOR

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: SW48N18M

Furnish and set in place per manufacturer's standard specifications and the following:

1. Mighty Top Sandwich Unit, 48"W, 13.4 cu ft capacity, two-section, (18) 1/6 size x 4" deep pans with 8" cutting board, (2) field rehingeable doors, stainless steel top, front & end panels, aluminum back & interior, rear mounted self-contained refrigeration, automatic hot gas condensate evaporator, R290 hydrocarbon refrigerant, 1/4 hp, cETLus, NSF
2. Cord & plug, standard
3. Left Door hinged on left & right door hinged on right, standard
4. Casters, 5" standard

ITEM #C90 RICE / GRAIN COOKER

Quantity: One (1)
Manufacturer: Panasonic
Model: SR-42HZP

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Commercial Rice Cooker, electric, (46) cups cooked rice capacity, serves approximately (94) 3 oz. portion servings, keep warm feature (8 hours), push button start, automatic shut-off, built-in double thermal fuse, anodized aluminum pan with stainless steel lid, includes measuring cup, silver exterior, cord with , cULus, ETLus, NSF

ITEM #C91 SPARE NO.

ITEM #C92 SPARE NO.

ITEM #C93 SPARE NO.

ITEM #C94 SPARE NO.

ITEM #C95 WORK TABLE

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Work table, see plans for width, length, height, and configuration.
2. Similar to standard details; FSD5-1, FSD1-7, FSD1-10, and FSD1-23. These standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
3. Work table with backsplash and undershelf, similar to detail FSD2-5.
4. Straight turn-down edge profile similar to detail FSD1-1A.
5. 4"-high square turn-back splash at walls similar to detail FSD1-5B.
6. Ship Hand Sink Item C95.1 to Fabricator to install in table at factory. Mount to underside of table, fully weld and polish all edges.

ITEM #C95.1 HAND SINK

Quantity: One (1)
Manufacturer: Eagle Group
Model: HWB-T

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hand Sink, Drop-In, one compartment, 17-1/2" x 16-1/2" x 17-1/4"H, type 304 stainless steel welded construction, 9-1/4" x 11-1/2" x 6" bowl, bullnose front edge, T&S deck mount gooseneck faucet with wrist handles, basket drain, soap on rear deck, C-fold towel dispenser, hinged door with pull handle & magnetic catch, NSF.
2. Ship to Fabricator to Install in Chef's Counter Item C95.
3. Mount to underside of table, fully weld and polish all edges

ITEM #C96 WALL SHELF, DOUBLE WITH CONCEALED BRACKETS

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Double wall shelf with concealed brackets.

ITEM #C97 EXHAUST HOOD WITH MAKE UP AIR

Quantity: One (1)
Manufacturer: Halton Company
Model: KVE

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Halton KVE Filter Type Exhaust Hood with Capture Jet™ 2nd generation system.
2. The canopy shall bear the Underwriters Laboratories U.L. label or ETL label, UL listed range hood without exhaust fire damper per standard 710 and be fabricated in compliance with NFPA-96 and shall bear the National Sanitation Foundation seal of approval. The exhaust airflow shall be within the ETL or UL listed air volumes and be based upon ASTM Standards (F1704-05) and (F2474-05).
3. The canopy inner liner shall be 18-gauge stainless steel where exposed, type 304 with #4 finish. The canopy shall have an integral exhaust duct collar. All seams of the inner liner shall have grease tight joints. Each canopy shall have a filter housing of the same material as the canopy liner. The filter housing shall be equipped with a concealed drip tray the full length of the canopy and with a grease cup for easy removal and daily cleaning.
4. The outer shell shall be 18-gauge stainless steel, where exposed, type 304 with #4 finish. Canopy ends shall be double sidewall construction (no single wall hoods permitted). All exterior joints shall be continuously welded liquid tight, ground smooth, and polished to a #4 finish. Tack welded, and cap seamed joints are not permitted.
5. The Capture Jet air shall be introduced through a special discharge panel and shall not exceed 15% of the calculated exhaust airflow. The Capture Jet discharge velocity will be a minimum of 1500 FPM. Slot type discharge shall not be used. The Capture Jet air increases the capture efficiency of the smoke and contaminated air at both the face and sides of the hood. The Capture Jet chamber is to be fully insulated.
6. Provide hood pre piped for Fire Suppression System.
7. Final connections to hood duct collar(s) by the Mechanical Division.
8. Hood construction and components to be UL and NSF listed.
9. Provide hood mounted switch panel for fan and lights.
10. Mounting height of bottom edge of hood to be 6'-8" above finished floor.
11. Verify and coordinate all dimensions, and duct requirements and locations with site and Mechanical Division.
12. See ventilation drawing sheet for general size and location of duct(s).
13. If not installed against the finished ceiling, provide matching stainless steel closure panels above hood to finished ceiling, to conceal duct(s) and hood fire suppression system piping; verify height. If finished ceiling is more than 24" above the top of the hood(s), or ceiling is open type ceiling, verify requirement for closure panels with Architect/Interior Designer.
14. The hood shall be equipped with model KSA multi-cyclone stainless steel grease extractors. Filters shall be rated at 93%-98% extraction efficiency on particulates in the 5-10-micron range based on ASTM Standard F-2519-05. The pressure loss over the extractor shall not exceed 0.50" of water at flow rates approved by UL for heavy load cooking. Sound levels shall not exceed an NC rating of 55. Baffle or slot type extractors shall not be used.
15. The hood shall be supplied with a control panel on the face of the hood consisting of:
    Exhaust Fan Switch with pilot light.
    Light Switch with pilot light.
16. Hangers, supports and miscellaneous accessories as required for installation.
17. The installation shall be in accordance with the manufacturer's recommendations and conform to NFPA-96 guidelines and all applicable local codes.
18. Air space at wall(s) to accommodate requirements of the latest edition of NFPA 96 clearance to combustibles.
19. All welded duct collar(s).
20. Provide with stainless steel compartment at end of hood for housing Fire Suppression System, if shown on drawings.
21. Hood shall be provided with hood mounted temperature sensor and control panel designed and installed to automatically activate the exhaust fan whenever cooking operation occurs. The

activation of the exhaust fan shall occur through and interlock with the cooking appliances, by means of heat sensor, per IMC 2006 507.2.1.1 requirements.

22. Provide with ceiling mounted supply air plenum as shown on hood detail drawings.
23. Provide and install Halton Patent Pending LED light fixture with the following certifications U.L., CSA, NSF and CE for use in grease exhaust hoods in quantity sufficient to provide 50-foot candles at the 36" A.F.F. cooking surface when hood is mounted 84" A.F.F. Halton LED light fixture is complete with die cast aluminum junction box with integral fins for natural heat dissipation. Input voltage of 24VDC with a power consumption not to exceed . The housing encases 24 LED light emitters with brightness of 1000 lumens. Lighting color shall be warm white (incandescent). Lamp body is stainless steel ring with a high temperature silicone seal. Junction box to accept standard ½" NPT fitting. Fixture shall come complete with integral power supply with an input voltage of 108VAC 305VAC and input frequency of 50/60 Hz. Input current rating shall be @ 120VAC. Fixture shall contain no mercury or lead.
24. Kitchen Equipment Contractor (K.E.C.) shall conduct an exhaust hood performance test for each exhaust hood in the KEC's scope of work at the conclusion of the project when all hoods and related cooking equipment are in operation. K.E.C. shall have manufacturer's factory authorized representative test and measure exhaust airflow rates, dampers, switches, and sequence of operation, with all appliances at operating temperatures. K.E.C. shall furnish a written report within ten (10) working days of substantial completion and acceptance of the project by the Owner, indicating the design requirements for each hood and the actual operating parameters as tested and measured.
25. Kitchen Equipment Contractor (K.E.C.) shall provide fire wrap insulation on top of the hood if required by local code authority.

ITEM #C97.1 HOOD CONTROL CABINET

Quantity: One (1)
Manufacturer: Halton Company
Model: M.A.R.V.E.L.

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Wall mounted cabinet to control M.A.R.V.E.L. intelligent demand controlled ventilation system.
2. Controls for exhaust hoods C97 & C111
3. Provide per fabricator's detail drawings in QF-702 sheet series.
4. Inter-wiring by E.C. and Low-Voltage Contractor.

ITEM #C98 FIRE SUPPRESSION SYSTEM

Quantity: One (1)
Manufacturer: Ansul Fire Protection
Model: ANSUL R-102

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Ansul R 102 Ansulex Liquid Fire Suppressant. Surface appliance nozzles, hood and duct protection nozzles in Exhaust Hood Item C97 & C111.
2. Provide per fabricator's detail drawings in QF702 sheet series.
3. Manual pull station and micro switches with two sets of normally open and two sets of normally closed contact points.
4. All exposed pipe and fittings to be chrome plated or stainless steel.

5. All components and labor necessary for completely installed system in accordance with manufacturer's listings and instructions, U.L. Standard 300, UL Standard 1254, NFPA NFPA-96, and all applicable local codes, standards, and regulations.
6. Components inside exhaust hood to be installed at hood manufacturer's shop during fabrication.
7. Provide with automatic mechanical gas shut off valves (not electric solenoid valves) for equipment below exhaust hood. Coordinate size(s) and installation with Plumbing Division.
8. Six month and twelve month inspections, servicing, and replacement of components as per N.F.P.A. 96.
9. Electrical Division to provide shunt trip breakers at main power panel, or disconnects, as designated by the Electrical Engineer; interconnected with micro switch at fire system control panel, for all electricity in and under exhaust hood. Shunt trips/disconnects to accomplish shut off of electricity in event of fire system activation.
10. Ansul to provide complete shop drawings, locate and/or verify and coordinate system tank(s), panel(s), and pull station(s) location(s) and requirements, and verify and coordinate with Mechanical Engineer's documents and Division 15's exhaust and supply air requirements for hood(s); for proper protection of hood(s) and equipment in and below the hood(s), controlling of associated components, and interconnection of multiple fire systems as required.
11. Provision and installation of components and system(s) to be by dealer and installer authorized, factory trained, and certified to sell, install, and service Ansul fire suppression system(s) as noted in this specification, at the time of bidding, installation, start-up, and warranty period of this project.
12. As part of this item, provide wall mounted type K Ansul hand held portable fire extinguisher, placard, and mounting bracket as required in the immediate vicinity of each cooking area, per NFPA-96 and NFPA-10. Additional fire extinguishers as required in the kitchen area are to be specified by the Architect and provided by the General Contractor.

ITEM #C99 WALL FLASHING

Quantity: One (1)
Manufacturer: Fabricated
Model: Custom

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Similar to standard detail FSD1-39. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
2. Provide 20-gauge stainless steel panels from top of coved tile base to ceiling.

ITEM #C100 FRYER BATTERY, ELECTRIC

Quantity: One (1)
Manufacturer: Pitco Frialator (Middleby)
Model: SE14RS-2FD

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Solstice™ Prepackaged Fryer System with Solstice™ Filter Drawer System, High Power, electric, (2) 50 lb. oil capacity full tanks, solid state controls, boil out, drain valve interlock, melt cycle, stainless steel tank, front & sides, under-fryer drawer filtration, total (-FF), ENERGY STAR®, cULus, NSF, CE, GS

2. NOTE: Power supply for basket lifts and filter motor is hard wired at the factory for 208v, 240v models
3. (2) DIRECT
4. Solid State Thermostat, standard
5. Basket, (2) oblong/twin size, 13-1/2" x 6-1/2" x 5-3/4" deep, long handle, regular mesh (shipped std (n/c) with models "T" SG14, SG14R, SSH55, SE14, SE14X, SE14B, SG14T, 35+, 45+, fryer batteries shipped with (1) per fryer
6. Casters, standard

ITEM #C101 SPREADER CABINET

Quantity: One (1)
Manufacturer: Vulcan
Model: VWT18

Fabricate/Furnish and set-in place per plans, details, and the following:

1. V Series Heavy Duty Range, modular, 18", work top, stainless steel front, front top ledge, side, base, burner box & stub back, Casters, CSA, NSF

ITEM #C102 CHARBROILER

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: B-40

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Charbroiler, countertop, electric, 4" high legs, cast iron grate, 24" wide, stainless steel construction, with grease pan and scraper/brush, UL, CE
2. 3-ph, field wired (field convertible)

ITEM #C102.1 EQUIPMENT STAND, REFRIGERATED BASE

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: D48GN

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Refrigerator Griddle Stand, one-section, (2) drawers, accommodates (2) 12" x 20" x 6", stainless steel top with drip guard marine edge, stainless steel exterior & interior, electronic control with digital display, hi-low alarm, high/low temperature alarm, self-contained refrigeration, R290 hydrocarbon refrigerant, 1/5 HP, 10' cord, cETLus, NSF, ENERGY STAR®
2. Cord & Plug, standard
3. Condensing unit on the right, standard
4. Casters, 3" diameter, 4"H overall, standard

ITEM #C103 GRIDDLE, ELECTRIC, COUNTERTOP

Quantity: One (1)
Manufacturer: Lang Manufacturing (Middleby)
Model: 124S

Fabricate/Furnish and set-in place per plans, details, and the following:

1. LG Series Griddle, electric, countertop, 24" W x 23" D cooking surface, 1" highly polished steel griddle plate, Selectronic™ solid state control every 12", 5-1/2" high side and backsplash, grease trough, temperature range 175° - 450°F, stainless steel exterior, 4" stainless steel legs, NSF, cETLus, Made in USA

ITEM #C104 INDUCTION RANGE, FLOOR MODEL

Quantity: One (1)
Manufacturer: Lang Manufacturing (Middleby)
Model: RI30C-APA

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Induction Range, electric, floor model, 30"W, (4) 8" glass induction hobs, convection oven base with (9) rack positions and (5) racks, 150°-450°F solid state oven thermostat with 1-hour timer, 2" vented stainless steel stub back, 430 stainless steel exterior, 4" casters, cULus, NSF

ITEM #C105 SPARE NO.

ITEM #C106 SPARE NO.

ITEM #C107 SPARE NO.

ITEM #C108 SPARE NO.

ITEM #C109 Work Table

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Work table, see plans for width, length, height, and configuration.
2. Similar to standard details; FSD5-1, FSD1-7, FSD1-10, and FSD1-23. These standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
3. Straight turn-down edge profile similar to detail FSD1-1A.
4. 4"-high square turn-back splash at walls similar to detail FSD1-5B.

5. Ship Hand Sink Item C95.1 to Fabricator to install in table at factory. Mount to underside of table, fully weld and polish all edges.

ITEM #C109.1 HAND SINK

Quantity: One (1)
Manufacturer: Eagle Group
Model: HWB-T

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hand Sink, Drop-In, one compartment, 17-1/2" x 16-1/2" x 17-1/4"H, type 304 stainless steel welded construction, 9-1/4" x 11-1/2" x 6" bowl, bullnose front edge, T&S deck mount gooseneck faucet with wrist handles, basket drain, soap on rear deck, C-fold towel dispenser, hinged door with pull handle & magnetic catch, NSF.
2. Ship to Fabricator to Install in Work table C109.
3. Mount to underside of table, fully weld and polish all edges

ITEM #C110 SPARE NO.

ITEM #C111 EXHAUST HOOD WITH MAKE UP AIR

Quantity: One (1)
Manufacturer: Halton Company
Model: KVE

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Halton KVE Filter Type Exhaust Hood with Capture Jet™ 2nd generation system.
2. The canopy shall bear the Underwriters Laboratories U.L. label or ETL label, UL listed range hood without exhaust fire damper per standard 710 and be fabricated in compliance with NFPA-96 and shall bear the National Sanitation Foundation seal of approval. The exhaust airflow shall be within the ETL or UL listed air volumes and be based upon ASTM Standards (F1704-05) and (F2474-05).
3. The canopy inner liner shall be 18-gauge stainless steel where exposed, type 304 with #4 finish. The canopy shall have an integral exhaust duct collar. All seams of the inner liner shall have grease tight joints. Each canopy shall have a filter housing of the same material as the canopy liner. The filter housing shall be equipped with a concealed drip tray the full length of the canopy and with a grease cup for easy removal and daily cleaning.
4. The outer shell shall be 18-gauge stainless steel, where exposed, type 304 with #4 finish. Canopy ends shall be double sidewall construction (no single wall hoods permitted). All exterior joints shall be continuously welded liquid tight, ground smooth, and polished to a #4 finish. Tack welded, and cap seamed joints are not permitted.
5. The Capture Jet air shall be introduced through a special discharge panel and shall not exceed 15% of the calculated exhaust airflow. The Capture Jet discharge velocity will be a minimum of 1500 FPM. Slot type discharge shall not be used. The Capture Jet air increases the capture efficiency of the smoke and contaminated air at both the face and sides of the hood. The Capture Jet chamber is to be fully insulated.

6. Provide hood pre piped for Fire Suppression System.
7. Final connections to hood duct collar(s) by the Mechanical Division.
8. Hood construction and components to be UL and NSF listed.
9. Provide hood mounted switch panel for fan and lights.
10. Mounting height of bottom edge of hood to be 6'-8" above finished floor.
11. Verify and coordinate all dimensions, and duct requirements and locations with site and Mechanical Division.
12. See ventilation drawing sheet for general size and location of duct(s).
13. If not installed against the finished ceiling, provide matching stainless steel closure panels above hood to finished ceiling, to conceal duct(s) and hood fire suppression system piping; verify height. If finished ceiling is more than 24" above the top of the hood(s), or ceiling is open type ceiling, verify requirement for closure panels with Architect/Interior Designer.
14. The hood shall be equipped with model KSA multi-cyclone stainless steel grease extractors. Filters shall be rated at 93%-98% extraction efficiency on particulates in the 5-10-micron range based on ASTM Standard F-2519-05. The pressure loss over the extractor shall not exceed 0.50" of water at flow rates approved by UL for heavy load cooking. Sound levels shall not exceed an NC rating of 55. Baffle or slot type extractors shall not be used.
15. The hood shall be supplied with a control panel on the face of the hood consisting of:
    Exhaust Fan Switch with pilot light.
    Light Switch with pilot light.
16. Hangers, supports and miscellaneous accessories as required for installation.
17. The installation shall be in accordance with the manufacturer's recommendations and conform to NFPA-96 guidelines and all applicable local codes.
18. Air space at wall(s) to accommodate requirements of the latest edition of NFPA 96 clearance to combustibles.
19. All welded duct collar(s).
20. Provide with stainless steel compartment at end of hood for housing Fire Suppression System, if shown on drawings.
21. Hood shall be provided with hood mounted temperature sensor and control panel designed and installed to automatically activate the exhaust fan whenever cooking operation occurs. The activation of the exhaust fan shall occur through and interlock with the cooking appliances, by means of heat sensor, per IMC 2006 507.2.1.1 requirements.
22. Provide with ceiling mounted supply air plenum as shown on hood detail drawings.
23. Provide and install Halton Patent Pending LED light fixture with the following certifications U.L., CSA, NSF and CE for use in grease exhaust hoods in quantity sufficient to provide 50-foot candles at the 36" A.F.F. cooking surface when hood is mounted 84" A.F.F. Halton LED light fixture is complete with die cast aluminum junction box with integral fins for natural heat dissipation. Input voltage of 24VDC with a power consumption not to exceed . The housing encases 24 LED light emitters with brightness of 1000 lumens. Lighting color shall be warm white (incandescent). Lamp body is stainless steel ring with a high temperature silicone seal. Junction box to accept standard ½" NPT fitting. Fixture shall come complete with integral power supply with an input voltage of 108VAC 305VAC and input frequency of 50/60 Hz. Input current rating shall be @ 120VAC. Fixture shall contain no mercury or lead.
24. Kitchen Equipment Contractor (K.E.C.) shall conduct an exhaust hood performance test for each exhaust hood in the KEC's scope of work at the conclusion of the project when all hoods and related cooking equipment are in operation. K.E.C. shall have manufacturer's factory authorized representative test and measure exhaust airflow rates, dampers, switches, and sequence of operation, with all appliances at operating temperatures. K.E.C. shall furnish a written report within ten (10) working days of substantial completion and acceptance of the project by the Owner, indicating the design requirements for each hood and the actual operating parameters as tested and measured.
25. Kitchen Equipment Contractor (K.E.C.) shall provide fire wrap insulation on top of the hood if required by local code authority.

ITEM #C112 SPARE NO.

ITEM #C113 WALL FLASHING

Quantity: One (1)
Manufacturer: Fabricated
Model: Custom

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Similar to standard detail FSD1-39. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
2. Provide 20 gauge stainless steel panels from top of coved tile base to ceiling.

ITEM #C114 COMBI OVEN, ELECTRIC

Quantity: One (1)
Manufacturer: Alto-Shaam
Model: 7-20E CLASSIC

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Stacked Configuration Prodigi™ Classic Combi Oven/Steamer, electric, boiler-free, countertop, (7) 18" x 26" full size sheet or (16) 12" x 20" full size hotel pan (GN 1/1) capacity, programmable, touch-screen control with steam/convection/combi cooking modes, SafeVent™ steam venting, (5) cleaning levels, door hinged right, high efficiency LED lighting, (2) side racks with (8) non-tilt support rails, stainless steel construction, adjustable stainless steel legs, EcoSmart®, cULus, UL EPH Classified, CE, IPX5, EAC, city-wide COA for New York City
2. ECO
3. 45.7-16.5-4-3 AWG, NO cord or plug

ITEM #C114.1 COMBI OVEN, ELECTRIC

Quantity: One (1)
Manufacturer: Alto-Shaam
Model: 10-20E CLASSIC

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Stacked Configuration Prodigi™ Classic Combi Oven/Steamer, electric, boiler-free, countertop, (10) 18" x 26" full size sheet or (22) 12" x 20" full size hotel pan (GN 1/1) capacity, (2) side racks with (11) non-tilt support rails, programmable, touch-screen control with steam/convection/combi cooking modes, SafeVent™ steam venting, (5) cleaning levels, door hinged right, high efficiency LED lighting, stainless steel construction, casters, EcoSmart®, cULus, UL EPH Classified, CE, IPX5, EAC, city-wide COA for New York City
2. ECO
3. 68.8-24.8-2-1 AWG, NO cord or plug

ITEM #C114.2 WATER FILTRATION SYSTEM, PARTS & ACCESSORIES

Quantity: One (1)
Manufacturer: Everpure
Model: EV929322

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Coldrink/Insurice Water Filtration Manifold, Coldrink/Insurice Twin, (1) EC210 prefilter, (1) Coldrink/Insurice Twin Manifold, mounting bracket, built-in water shut-off valve, outlet pressure gauge, 3/4" inlet, 3/4" outlet (EV929322)

ITEM #C115 FLOOR TROUGH

Quantity: One (1)
Manufacturer: IMC/Teddy
Model: TRE-36-SQ

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Trench Drain System, 36"W x 4"D, 4" deep receptacle, (1) 2" OD drain, perforated waste strainer, 14/304 stainless steel, brushed satin finish, (SQ) grid grating, NSF, Made in USA

ITEM #C116 FRYER BATTERY, ELECTRIC

Quantity: One (1)
Manufacturer: Pitco Frialator (Middleby)
Model: SE14RS-2FD

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Solstice™ Prepackaged Fryer System with Solstice™ Filter Drawer System, High Power, electric, (2) 50 lb. oil capacity full tanks, solid state controls, boil out, drain valve interlock, melt cycle, stainless steel tank, front & sides, under-fryer drawer filtration, total (-FF), ENERGY STAR®, cULus, NSF, CE, GS
2. (2) DIRECT
3. Solid State Thermostat, standard
4. Basket, (2) oblong/twin size, 13-1/2" x 6-1/2" x 5-3/4" deep, long handle, regular mesh (shipped std (n/c) with models "T" SG14, SG14R, SSH55, SE14, SE14X, SE14B, SG14T, 35+, 45+, fryer batteries shipped with (1) per fryer
5. Casters, Standard

ITEM #C117 SPREADER CABINET

Quantity: One (1)
Manufacturer: Vulcan
Model: VWT18

Fabricate/Furnish and set-in place per plans, details, and the following:

1. V Series Heavy Duty Range, modular, 18", work top, stainless steel front, front top ledge, side, base, burner box & stub back, Casters, CSA, NSF

ITEM #C118 GRIDDLE

Quantity: One (1)
Manufacturer: Lang Manufacturing (Middleby)
Model: 160T

Fabricate/Furnish and set-in place per plans, details, and the following:

1. LG Heavy Duty Griddle, electric, countertop, 60" W x 23" D cooking surface, 1" thick polished steel griddle plate, 200°-550° F snap-action thermostat and elements every 12", welded steel frame with stainless steel exterior, 5" tapered wrap-around splash guard, 8qt grease drawer, 4" stainless steel legs with 1-5/8" adjustment, & NSF, Made in USA

ITEM #C118.1 REFRIGERATED EQUIPMENT STAND

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: D60GN

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Refrigerator Griddle Stand, one-section, (2) drawers, accommodates (3) 12" x 20" x 6", stainless steel top with drip guard marine edge, stainless steel exterior & interior, electronic control with digital display, hi-low alarm, self-contained refrigeration, R290 hydrocarbon refrigerant, 1/4 HP, 10' cord, cETLus, NSF, ENERGY STAR®
2. Cord & Plug, Standard
3. Condensing unit on the right, standard
4. Casters, 3" diameter, 4"H overall, standard

ITEM #C119 SPARE NO.

ITEM #C120 SPARE NO.

ITEM #C121 SPARE NO.

ITEM #C122 SERVING COUNTER

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Service counter, see plans and elevations for width, length and configuration.
2. Similar to standard details; FSD7-1, FSD1-7, FSD1-10, and FSD1-23. These standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
3. Basic configuration to be stainless steel base cabinet with décor top and faces, as selected by the Interior Designer. Provide full size 3/4" thick structurally sound substrate on top and faces for mounting décor finish materials, unless otherwise instructed. Refer to fabrication details, counter cladding details and/or Interior Designer's details and specifications for complete instructions on fabrication, dimensions, materials, and installation.
4. Cabinet base with hinged doors with locks.
5. Cabinet base with open shelf.
6. Provide hinged louvered access doors at all compressor locations.
7. Provide sufficient ventilation for compressors, add fan if needed.
8. Provide open shelving with adjustable middle shelf as shown on elevations.
9. Provide 14-gauge " stainless steel removable kick plates per FSD1-23.
10. Counter to be mounted on 6" high, stainless steel legs with adjustable stainless-steel feet.
11. Coordinate cut-outs for all equipment mounted within counter top.
12. Where shown, entire counter to be pre-wired to a built-in circuit breaker panel. This shall include all outlets, J-boxes, conduit, wiring, electrical components, and accessories attached to, or built into the counter. All conduit, with wiring, shall be concealed from view, and installed in a manner that will not interfere with the intended use of the counter. Panel to include a main breaker for single circuit service connection, and individual breakers for items included in the counter. Panel and electrical components and installation shall comply with the National Electrical Code. Verify and coordinate panel service circuit size, load, phasing, and requirements with the Electrical Engineer's documents, and the Electrical Division. Fabrication shop to be NEC approved.
13. Entire counter to be pre-wired to an accessible pull-box. This shall include all outlets, J-boxes, conduit, wiring, electrical components, and accessories attached to, or built into the counter. All conduits, with wiring, shall be concealed from view and installed in a manner, which will not interfere with the intended use of the counter. Electrical components and installation shall comply with the National Electrical Code. Verify and coordinate pull box location with rough-in location. Pigtails shall be tagged with the electrical requirements and identification of the equipment they serve; ready for final connection by the Electrical Division. Refer to detail MEP8-3.
14. KEC to provide faucets where shown. Fabricator to coordinate all penetrations and plumbing line runs within counter assembly within shop.
15. Cutting boards to be length and width where shown on plan x 3/4" thick, NSF approved, ultra-high density linear polyethylene, in sections as shown; removable, reversible, interchangeable and held in place by stainless steel clips welded to counter top.
16. Coordinate cut-outs for all equipment mounted within counter top.
17. Install remote controls on service side of counter
18. Counter, tops, food shields, etc. to be manufactured by NSF, NEC, UL certified fabricator.
19. Counter and food shield to be manufactured by same fabricator to assure proper fit finish and structural integrity.
20. Stone top, die wall and fascia finish specification/selection by Interior Designer, but provided by KEC. Top to be provided as specified by Interior Designer. Support top as required, provide grommets and stainless-steel escutcheons where wiring penetration is required.
21. Cut outs in counter tops for drop-in equipment to have proper heat isolation insulation and framework, see details on counter fabrication drawings.
22. Penetrations in counter top for utilities and supply lines to be complete with grommets - finish per Interior Designer. Penetrations to be field-located and field drilled per Owner/Operator direction.

23. Basic configuration to be construction using stainless steel end panels, 14-gauge galvanized horizontal and vertical structural supports providing integral utility chase concealed by 18-gauge stainless steel, removable back panels. 18-gauge intermediate shelves as required. 16-gauge bottom shelves.
24. Bottom shelf to include removable, flush-with-shelf access panel for floor sink access below as required.
25. 16-gauge stainless steel aprons for equipment controls, where shown.
26. Counter front where tile called for to be tile backer board with tile applied in field by others.
27. Cash drawers to be field-mounted and fully coordinated in shop.
28. KEC to field-coordinate drop heat lamp rough-ins with counters below and utilize field templates for same.
29. KEC and fabricator to field-template counter tops prior to top fabrication and coordinate existing to be refurbished wall conditions that interface counter tops with G.C.
30. Provide required heat removal ventilation for self-contained or remote refrigerated equipment within counter per manufacturer's requirements. Provide additional fans, grating, through-ventilation as required. Coordinate same with Interior Designer.
31. Provide shop-installed refrigeration sleeves through base cabinetry and plan for same as part of shop drawing process. KEC, refrigeration contractor, G.C. plumbing contractor, electrical contractor and fabricator to FIELD-coordinate line-runs, penetrations, sleeving, access hatching, field-connection planning all prior to commencement of counter fabrication. The above shall be evident on submitted shop drawings for all fabricated counters or tabling.

ITEM #C122.2 HOT / COLD FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)
Model: HRCP-7300

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hot/Cold Drop In Unit, 3-pan size, single tank with switch for hot or cold operation with self-contained refrig., automatic water fill, includes (2) pan dividers, R(COLD) 1/3 HP, (HOT) 208/14.4-direct, NSF, cULus

ITEM #C122.3 FOOD SHIELD, VERTICAL

Quantity: One (1)
Manufacturer: BSI
Model: CV100-2

Fabricate/Furnish and set-in place per plans, details, and the following:

1. BSI, LLC ClearView Food Shield, full-service, 18"D x 26"H, clean seam, UV bonded tempered glass, NSF-Component
2. 1/2" Tempered glass (centerline max 72")
3. Glass Clips (secured to counter)

ITEM #C122.4 HOT FOOD WELL UNIT, DROP-IN, ELECTRIC

Quantity: One (1)
Manufacturer: Wells (Middleby)

Model: SS-10TDUCIAF

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Food Warmer, top-mount, built-in, electric, for 11 quart round insert, drain, with auto-fill, wet/dry operation, thermostatic control, fully insulated, stainless steel construction, Wellslok, cULus, NSF
2. with cord and plug

ITEM #C122.5 FOOD SHIELD WITH HEAT AND LIGHTS

Quantity: One (1)
Manufacturer: BSI
Model: ZG9930

Fabricate/Furnish and set-in place per plans, details, and the following:

1. ZGuard® Food Shield, single, self service, fully adjustable, 20-1/2" height, 14" wide tempered glass top & lower sneeze guard, 1" diameter tubing double supports, cULus.
2. Tubing to be cooridnated (NOTE: aluminum may be used only on above counter mounts)
3. Frame finish as selected by Architect/I.D.
4. 1" radius corner, standard.
5. Stealth™ Warmer & Light Combo, cULus, NSF.
6. Voltage & Length to be coordinated
7. 3000K LED Lamp, cULus, NSF.
8. Remote infinite control.
9. Wiring exit point to be coordinated
10. Provide shop drawings for review/approval.

ITEM #C123 CARVING STATION

Quantity: One (1)
Manufacturer: Alto-Shaam
Model: CS-200/S

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hot Carving Shelf, 33" x 25-3/4" x 30-15/16", indicator light, infrared lamp, (3) position HI/LOW/OFF toggle switch, cutting board, 70 lb. max capacity, recessed surface, framed clear glass breath guard, 1" legs, 18 gauge stainless steel construction, EcoSmart®, cULus, NSF, CE, EAC
2. Cord & Plug, standard

ITEM #C124 RICE / GRAIN COOKER

Quantity: One (1)
Manufacturer: Panasonic
Model: SR-42HZP

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Commercial Rice Cooker, electric, (46) cups cooked rice capacity, serves approximately (94) 3 oz. portion servings, keep warm feature (8 hours), push button start, automatic shut-off, built-in double thermal fuse, anodized aluminum pan with stainless steel lid, includes measuring cup, silver exterior, cord with , cULus, ETLus, NSF

ITEM #C125 SPARE NO.

ITEM #C126 SPARE NO.

ITEM #C127 SPARE NO.

ITEM #C128 SPARE NO.

ITEM #C129 SPARE NO.

ITEM #C130 WORK TABLE

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Work counter, see plans for width, length, height, and configuration.
2. Similar to standard details; FSD5-1, FSD1-7, FSD1-10, and FSD1-23. These standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
3. Straight turn-down edge profile similar to detail FSD1-1A.
4. Provide hinged louvered access doors at all compressor locations.
5. Provide open space for under counter for equipment as shown on plans. Coordinate fabrication so that equipment fits completely under top.
6. 4"-high square turn-back splash at walls similar to detail FSD1-5B.
7. Ship Hand Sink Item C130.1 to Fabricator to install in table at factory. Mount to underside of table, fully weld and polish all edges.

ITEM #C130.1 HAND SINK

Quantity: One (1)
Manufacturer: Eagle Group
Model: HWB-T

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hand Sink, Drop-In, one compartment, 17-1/2" x 16-1/2" x 17-1/4"H, type 304 stainless steel welded construction, 9-1/4" x 11-1/2" x 6" bowl, bullnose front edge, T&S deck mount gooseneck faucet with wrist handles, basket drain, soap on rear deck, C-fold towel dispenser, hinged door with pull handle & magnetic catch, NSF.
2. Ship to Fabricator to Install in Work Counter Item C130.
3. Mount to underside of table, fully weld and polish all edges

ITEM #C131 UNDERCOUNTER REFRIGERATOR

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: SW48NGD-U

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Undercounter Display Refrigerator, 48"W, 13.4 cu ft capacity, two-section, (2) glass doors, LED lighting, stainless steel front, top & end panels, aluminum interior, 1-3/8" diameter plate casters, front breathing, rear-mounted self-contained refrigeration, R290 Hydrocarbon refrigerant, 1/5 HP, cETLus, NSF
2. cord, , standard
3. Doors hinged per plan

ITEM #C132 LOCKABLE CABINETRY; QTY: 1, N.I.K.E.C.- BY ARCHITECT/G.C.

ITEM #C133 SPARE NO.

ITEM #C134 SPARE NO.

ITEM #C135 SPARE NO.

ITEM #C136 SPARE NO.

ITEM #C137 CHEFS COUNTER W/SINK

Quantity: One (1)
Manufacturer: Fabricated
Model: Custom

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Similar-to standard details; FSD1-1B, FSD1-7, FSD1-10, FSD1-FSD1-19B, FSD1-24, FSD1-27, FSD9-1, FSD9-2, FSD9-FSD9-3B, FSD9-FSD9-4B, FSD9-5, FSD9-6, and FSD9-7. These standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.

2. Provide 120-volt duplex electrical receptacles mounted under lower overshelf where shown on plans. Provide with stainless steel mounting brackets and cover plates. Conceal wiring in overshelf support. Terminate wiring at Pull Box, or Load Center, as specified in this item. Provide minimum load for each receptacle.

ITEM #C138 UNDERCOUNTER REFRIGERATOR

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: D48N-U-D

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Designer Line Undercounter Refrigerator, 48"W, two-section, (4) drawers, accommodates (1) 12 x 18 x 6 pan per drawer or (1) 1/2 x 6 pan & (1) 1/3 x 6 pans per drawer capacity (supplied by others), stainless steel exterior & interior, stainless steel top, 1-3/8" diameter plate casters, front breathing, electronic control with digital display, hi-low alarm, rear mounted self-contained refrigeration, R290 hydrocarbon refrigerant, 1/5 hp, cETLus
2. cord & plug, standard

ITEM #C139 REACH-IN UNDERCOUNTER FREEZER

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: DF27N-U

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Designer Line Undercounter Freezer, 27"W, one-section, (1) field rehingeable door, stainless steel exterior & interior, stainless steel top, 1-3/8" diameter plate casters, front breathing, electronic control with digital display, hi-low alarm, rear mounted self-contained refrigeration, R290 hydrocarbon refrigerant, 1/4 HP, cETLus, NSF
2. Cord & Plug, standard
3. Door hinged per plan

ITEM #C140 SPARE NO.

ITEM #C141 SPARE NO.

ITEM #C142 SPARE NO.

ITEM #C143 SPARE NO.

ITEM #C144 WORK TABLE

Quantity: One (1)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Work table, see plans for width, length, height, and configuration.
2. Similar to standard details; FSD5-1, FSD1-7, FSD1-10, and FSD1-23. These standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
4. Straight turn-down edge profile similar to detail FSD1-1A.
5. 4"-high square turn-back splash at walls similar to detail FSD1-5B.
6. Ship Hand Sink Item C144.1 to Fabricator to install in table at factory. Mount to underside of table, fully weld and polish all edges

ITEM #C144.1 HAND SINK

Quantity: One (1)
Manufacturer: Eagle Group
Model: HWB-T

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hand Sink, Drop-In, one compartment, 17-1/2" x 16-1/2" x 17-1/4"H, type 304 stainless steel welded construction, 9-1/4" x 11-1/2" x 6" bowl, bullnose front edge, T&S deck mount gooseneck faucet with wrist handles, basket drain, soap on rear deck, C-fold towel dispenser, hinged door with pull handle & magnetic catch, NSF.
2. Ship to Fabricator to Install in Work table Item C144.
3. Mount to underside of table, fully weld and polish all edges

ITEM #C145 EXHAUST HOOD WITH MAKE UP AIR

Quantity: One (1)
Manufacturer: Halton Company
Model: KVE

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Halton KVE Filter Type Exhaust Hood with Capture Jet™ 2nd generation system.
2. The canopy shall bear the Underwriters Laboratories U.L. label or ETL label, UL listed range hood without exhaust fire damper per standard 710 and be fabricated in compliance with NFPA-96 and shall bear the National Sanitation Foundation seal of approval. The exhaust airflow shall be within the ETL or UL listed air volumes and be based upon ASTM Standards (F1704-05) and (F2474-05).
3. The canopy inner liner shall be 18-gauge stainless steel where exposed, type 304 with #4 finish. The canopy shall have an integral exhaust duct collar. All seams of the inner liner shall have grease tight joints. Each canopy shall have a filter housing of the same material as the canopy

liner. The filter housing shall be equipped with a concealed drip tray the full length of the canopy and with a grease cup for easy removal and daily cleaning.

4. The outer shell shall be 18-gauge stainless steel, where exposed, type 304 with #4 finish. Canopy ends shall be double sidewall construction (no single wall hoods permitted). All exterior joints shall be continuously welded liquid tight, ground smooth, and polished to a #4 finish. Tack welded, and cap seamed joints are not permitted.
5. The Capture Jet air shall be introduced through a special discharge panel and shall not exceed 15% of the calculated exhaust airflow. The Capture Jet discharge velocity will be a minimum of 1500 FPM. Slot type discharge shall not be used. The Capture Jet air increases the capture efficiency of the smoke and contaminated air at both the face and sides of the hood. The Capture Jet chamber is to be fully insulated.
6. Provide hood pre piped for Fire Suppression System.
7. Final connections to hood duct collar(s) by the Mechanical Division.
8. Hood construction and components to be UL and NSF listed.
9. Provide hood mounted switch panel for fan and lights.
10. Mounting height of bottom edge of hood to be 6'-8" above finished floor.
11. Verify and coordinate all dimensions, and duct requirements and locations with site and Mechanical Division.
12. See ventilation drawing sheet for general size and location of duct(s).
13. If not installed against the finished ceiling, provide matching stainless steel closure panels above hood to finished ceiling, to conceal duct(s) and hood fire suppression system piping; verify height. If finished ceiling is more than 24" above the top of the hood(s), or ceiling is open type ceiling, verify requirement for closure panels with Architect/Interior Designer.
14. The hood shall be equipped with model KSA multi-cyclone stainless steel grease extractors. Filters shall be rated at 93%-98% extraction efficiency on particulates in the 5-10-micron range based on ASTM Standard F-2519-05. The pressure loss over the extractor shall not exceed 0.50" of water at flow rates approved by UL for heavy load cooking. Sound levels shall not exceed an NC rating of 55. Baffle or slot type extractors shall not be used.
15. The hood shall be supplied with a control panel on the face of the hood consisting of:
    Exhaust Fan Switch with pilot light.
    Light Switch with pilot light.
16. Hangers, supports and miscellaneous accessories as required for installation.
17. The installation shall be in accordance with the manufacturer's recommendations and conform to NFPA-96 guidelines and all applicable local codes.
18. Air space at wall(s) to accommodate requirements of the latest edition of NFPA 96 clearance to combustibles.
19. All welded duct collar(s).
20. Provide with stainless steel compartment at end of hood for housing Fire Suppression System, if shown on drawings.
21. Hood shall be provided with hood mounted temperature sensor and control panel designed and installed to automatically activate the exhaust fan whenever cooking operation occurs. The activation of the exhaust fan shall occur through and interlock with the cooking appliances, by means of heat sensor, per IMC 2006 507.2.1.1 requirements.
22. Provide with ceiling mounted supply air plenum as shown on hood detail drawings.
23. Provide and install Halton Patent Pending LED light fixture with the following certifications U.L., CSA, NSF and CE for use in grease exhaust hoods in quantity sufficient to provide 50-foot candles at the 36" A.F.F. cooking surface when hood is mounted 84" A.F.F. Halton LED light fixture is complete with die cast aluminum junction box with integral fins for natural heat dissipation. Input voltage of 24VDC with a power consumption not to exceed . The housing encases 24 LED light emitters with brightness of 1000 lumens. Lighting color shall be warm white (incandescent). Lamp body is stainless steel ring with a high temperature silicone seal. Junction box to accept standard ½" NPT fitting. Fixture shall come complete with integral power

supply with an input voltage of 108VAC 305VAC and input frequency of 50/60 Hz. Input current rating shall be @ 120VAC. Fixture shall contain no mercury or lead.

24. Kitchen Equipment Contractor (K.E.C.) shall conduct an exhaust hood performance test for each exhaust hood in the KEC's scope of work at the conclusion of the project when all hoods and related cooking equipment are in operation. K.E.C. shall have manufacturer's factory authorized representative test and measure exhaust airflow rates, dampers, switches, and sequence of operation, with all appliances at operating temperatures. K.E.C. shall furnish a written report within ten (10) working days of substantial completion and acceptance of the project by the Owner, indicating the design requirements for each hood and the actual operating parameters as tested and measured.
25. Kitchen Equipment Contractor (K.E.C.) shall provide fire wrap insulation on top of the hood if required by local code authority.

ITEM #C145.1 HOOD CONTROL CABINET

Quantity: One (1)
Manufacturer: Halton Company
Model: M.A.R.V.E.L.

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Wall mounted cabinet to control M.A.R.V.E.L. intelligent demand controlled ventilation system.
2. Controls for exhaust hoods items C145
3. Provide per fabricator's detail drawings in QF702 sheet series.
4. Inter-wiring by E.C. and Low-Voltage Contractor.

ITEM #C146 FIRE SUPPRESSION SYSTEM

Quantity: One (1)
Manufacturer: Ansul Fire Protection
Model: ANSUL R-102

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Ansul R 102 Ansulex Liquid Fire Suppressant. Surface appliance nozzles, hood and duct protection nozzles in Exhaust Hood Item C145
2. Provide per fabricator's detail drawings in QF702 sheet series.
3. Manual pull station and micro switches with two sets of normally open and two sets of normally closed contact points.
4. All exposed pipe and fittings to be chrome plated or stainless steel.
5. All components and labor necessary for completely installed system in accordance with manufacturer’s listings and instructions, U.L. Standard 300, UL Standard 1254, NFPA NFPA-96, and all applicable local codes, standards, and regulations.
6. Components inside exhaust hood to be installed at hood manufacturer's shop during fabrication.
7. Provide with automatic mechanical gas shut off valves (not electric solenoid valves) for equipment below exhaust hood. Coordinate size(s) and installation with Plumbing Division.
8. Six month and twelve month inspections, servicing, and replacement of components as per N.F.P.A. 96.
9. Electrical Division to provide shunt trip breakers at main power panel, or disconnects, as designated by the Electrical Engineer; interconnected with micro switch at fire system control

panel, for all electricity in and under exhaust hood. Shunt trips/disconnects to accomplish shut off of electricity in event of fire system activation.

10. Ansul to provide complete shop drawings, locate and/or verify and coordinate system tank(s), panel(s), and pull station(s) location(s) and requirements, and verify and coordinate with Mechanical Engineer's documents and Division 15's exhaust and supply air requirements for hood(s); for proper protection of hood(s) and equipment in and below the hood(s), controlling of associated components, and interconnection of multiple fire systems as required.
11. Provision and installation of components and system(s) to be by dealer and installer authorized, factory trained, and certified to sell, install, and service Ansul fire suppression system(s) as noted in this specification, at the time of bidding, installation, start-up, and warranty period of this project.
12. As part of this item, provide wall mounted type K Ansul hand held portable fire extinguisher, placard, and mounting bracket as required in the immediate vicinity of each cooking area, per NFPA-96 and NFPA-10. Additional fire extinguishers as required in the kitchen area are to be specified by the Architect and provided by the General Contractor.

ITEM #C147 WALL FLASHING

Quantity: One (1)
Manufacturer: Fabricated
Model: Custom

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Similar to standard detail FSD1-39. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions.
2. Provide 20-gauge stainless steel panels from top of coved tile base to ceiling.

ITEM #C148 COMBI OVEN, ELECTRIC

Quantity: One (1)
Manufacturer: Alto-Shaam
Model: 7-20E CLASSIC

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Stacked Configuration Prodigi™ Classic Combi Oven/Steamer, electric, boiler-free, countertop, (7) 18" x 26" full size sheet or (16) 12" x 20" full size hotel pan (GN 1/1) capacity, programmable, touch-screen control with steam/convection/combi cooking modes, SafeVent™ steam venting, (5) cleaning levels, door hinged right, high efficiency LED lighting, (2) side racks with (8) non-tilt support rails, stainless steel construction, adjustable stainless steel legs, EcoSmart®, cULus, UL EPH Classified, CE, IPX5, EAC, city-wide COA for New York City
2 ECO
3. 45.7-16.5-4-3 AWG, NO cord or plug

ITEM #C148.1 COMBI OVEN, ELECTRIC

Quantity: One (1)
Manufacturer: Alto-Shaam

Model: 10-20E CLASSIC

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Stacked Configuration Prodigi™ Classic Combi Oven/Steamer, electric, boiler-free, countertop, (10) 18" x 26" full size sheet or (22) 12" x 20" full size hotel pan (GN 1/1) capacity, (2) side racks with (11) non-tilt support rails, programmable, touch-screen control with steam/convection/combi cooking modes, SafeVent™ steam venting, (5) cleaning levels, door hinged right, high efficiency LED lighting, stainless steel construction, adjustable stainless steel legs, EcoSmart®, cULus, UL EPH Classified, CE, IPX5, EAC, city-wide COA for New York City
2. ECO
3. 68.8-24.8-2-1 AWG, NO cord or plug

ITEM #C148.2 WATER FILTRATION SYSTEM, PARTS & ACCESSORIES

Quantity: One (1)
Manufacturer: Everpure
Model: EV929322

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Coldrink/Insurice Water Filtration Manifold, Coldrink/Insurice Twin, (1) EC210 prefilter, (1) Coldrink/Insurice Twin Manifold, mounting bracket, built-in water shut-off valve, outlet pressure gauge, 3/4" inlet, 3/4" outlet (EV929322)

ITEM #C149 FLOOR TROUGH

Quantity: One (1)
Manufacturer: IMC/Teddy
Model: TRE-36-SQ

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Trench Drain System, 36"W x 4"D, 4" deep receptacle, (1) 2" OD drain, perforated waste strainer, 14/304 stainless steel, brushed satin finish, (SQ) grid grating, NSF, Made in USA

ITEM #C150 INDUCTION RANGE, FLOOR MODEL

Quantity: One (1)
Manufacturer: Lang Manufacturing (Middleby)
Model: RI30C-APA

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Induction Range, electric, floor model, 30"W, (4) 8" glass induction hobs, convection oven base with (9) rack positions and (5) racks, 150°-450°F solid state oven thermostat with 1-hour timer, 2" vented stainless steel stub back, 430 stainless steel exterior, 4" casters, cULus, NSF
2. Voltage to be verified with jobsite

ITEM #C151 GRIDDLE, ELECTRIC, COUNTERTOP

Quantity: One (1)
Manufacturer: Lang Manufacturing (Middleby)
Model: 136S

Fabricate/Furnish and set-in place per plans, details, and the following:

1. LG Series Griddle, electric, countertop, 36" W x 23" D cooking surface, 1" highly polished steel griddle plate, Selectronic™ solid state control every 12", 5-1/2" high side and backsplash, grease trough, temperature range 175° - 450°F, stainless steel exterior, 4" stainless steel legs, NSF, cETLus, Made in USA
2. Voltage to be verified with jobsite

ITEM #C151.1 REFRIGERATED EQUIPMENT STAND

Quantity: One (1)
Manufacturer: Continental Refrigerator
Model: D36GN

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Refrigerator Griddle Stand, one-section, (2) drawers - accommodates (1) 12" x 20" x 6" & (1) 6" x 20" x 6", stainless steel top with drip guard marine edge, stainless steel exterior & interior, electronic control with digital display, hi-low alarm, high/low temperature alarm, self-contained refrigeration, R290 hydrocarbon refrigerant, 1/5 HP, 10' cord, cETLus, NSF, ENERGY STAR®
2. cord, , standard
3. Condensing unit on the right, standard
4. Casters, 3" diameter, 4"H overall, standard

ITEM #C152 FRYER BATTERY, ELECTRIC

Quantity: One (1)
Manufacturer: Pitco Frialator (Middleby)
Model: SE14RS-2FD

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Solstice™ Prepackaged Fryer System with Solstice™ Filter Drawer System, High Power, electric, (2) 50 lb. oil capacity full tanks, solid state controls, boil out, drain valve interlock, melt cycle, stainless steel tank, front & sides, under-fryer drawer filtration, total (-FF), ENERGY STAR®, cULus, NSF, CE, GS
2. (2) DIRECT
3. Solid State Thermostat, standard
4. Basket, (2) oblong/twin size, 13-1/2" x 6-1/2" x 5-3/4" deep, long handle, regular mesh (shipped std (n/c) with models "T" SG14, SG14R, SSH55, SE14, SE14X, SE14B, SG14T, 35+, 45+, fryer batteries shipped with (1) per fryer
5. Casters, standard

ITEM #C153 SPREADER CABINET

Quantity: One (1)
Manufacturer: Vulcan
Model: VWT18

Fabricate/Furnish and set-in place per plans, details, and the following:

1. V Series Heavy Duty Range, modular, 18", work top, stainless steel front, front top ledge, side, base, burner box & stub back, Casters, CSA, NSF

ITEM #C155 SPARE NO.

ITEM #C154 SPARE NO.

ITEM #C156 SPARE NO.

ITEM #C157 SPARE NO.

ITEM #C158 TRAY & SILVERWARE CART

Quantity: Four (4)
Manufacturer: Piper Products/Servolift Eastern
Model: PTS/1520MO

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Mobile Tray & Silverware Dispenser, single stack, open style, (8) cylinders, holds (150) 15-3/8" x 20-3/4" trays, stainless steel, NSF

ITEM #D1 CLEAN DISH STORAGE SHELVING

Quantity: Nine (9)
Manufacturer: Metro
Model: METROSEAL 3

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Length, width and configuration per plan and verified room dimensions.
2. Super Erecta Metroseal 3 wire shelving. Chrome, Corrosion-resistant finish, with Microban® antimicrobial protection.
3. 86" High with five tiers.
4. Each section shall be free-standing with four legs.

ITEM #D2 GLASS RACK DOLLY

Quantity: Three (3)
Manufacturer: Metro

Model: D2020N

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Quick Ship - Dish Rack Dolly, platform design, single stack, designed for 20" x 20" racks, 5"Heavy duty, non-marking, resilient tread swivel casters, corner bumpers, all aluminum construction, without handle

ITEM #D3 DISH DOLLY

Quantity: Three (3)
Manufacturer: Metro
Model: PCD11A

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Quick Ship - Poker Chip Dish Dolly, 26-5/8"W x 26-5/8"D x 31-15/16"H, adjustable, dish size 4-1/4" to 11-3/4", removable dividers & towers, two-handed access, recessed handles, 5"Dia. swivel casters with neoprene wheels (2 with brakes), chip-resistant polymer shell with Microban® antimicrobial protection, aesthetic blue, vinyl dust/water splash cover, NSF
2. WARNING: This product can expose you to chemicals, including DEHP, which are known to the State of California to cause cancer, birth defects and other reproductive harm. For more information, go to www.P65Warnings.ca.gov.

ITEM #D4 HAND SINK ASSEMBLY

Quantity: One (1)
Manufacturer: Eagle Group
Model: YHFL-5000-0013-00

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hand Washing System, includes hand sink with integral (welded) left and right side splashes, electronic eye splash mounted T&S faucet with battery saving hydro generator power source, touchless hand sanitizing dispenser, hands free soap dispenser, automated touchless paper towel dispenser, food handler glove rack, white bristle nail brush, with stainless steel skirt assembly in lieu of trash receptacle. Provide end splashes on both ends, 304 stainless steel, NSF.

ITEM #D5 TRASH RECEPTACLE, 23 GALLON; QTY: 2, N.I.K.E.C.- BY OWNER/OPERATOR

ITEM #D6 SPARE NO.

ITEM #D7 SPARE NO.

ITEM #D8 SPARE NO.

ITEM #D9 DISHWASHER, FLIGHT TYPE

Quantity: One (1)
Manufacturer: Hobart
Model: FT1000SE+ENERGY

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Low energy series energy recovery model without power rinse flight type dish machine, 58 gallons of final rinse consumption per hour, with dual rinse, hinged & insulated doors, sliding wash arms without caps, & microprocessor controls, Complete Delime with Delime Notification, Auto Dispensing and Booster Guard, Energy Recovery, 16" round flange & Automatic Soil Removal system (ASR), Free factory startup for installations within a 100 mile radius of a Hobart service office; installation beyond 100 miles will be charged at the quoted rate by the local Hobart service office ENERGY STAR®
2. Oversized units with crated shipping dimensions greater or equal to 72" in length and/or 90" in height. If delivery is to a facility without a standard height dock, additional shipping charges will apply depending on the service requested. consult Factory.
3. Service Labor Hours for ENERGY: Required machine assembly by Hobart Service - for assembly within 100 miles of a Hobart Service Office during normal business hours, with appropriate notice; beyond 100 miles to be quoted by Hobart Service. Includes assembly of this item only, final electrical or plumbing connections by others. For prevailing wage, or projects in correctional /other secure areas, please contact the local service office in advance or project may be subject to additional fees billed at time of assembly.
4. Without Automatic Soil Removal (ASR)
5. Load Platform 2.5’ (Total LOAD length is 2.5’ load platform +3’ prewash = 5’7”)
6. Drain in Unload
7. Complete Delime with delime notification, auto dispensing & booster guard
8. With Dual Rinse
9. Standard Non-Split 5' Center Joined (Wash/Dual Rinse)
10. 7' 5" Unload Section Non Split
11. With Blower Dryer
12. Service Labor Hours for Blower Dryer: Required machine assembly by Hobart Service - for assembly within 100 miles of a Hobart Service Office during normal business hours, with appropriate notice; beyond 100 miles to be quoted by Hobart Service. Includes assembly of this item only, final electrical or plumbing connections by others. For prevailing wage, or projects in correctional /other secure areas, please contact the local service office in advance or project may be subject to additional fees billed at time of assembly.
13. TLG - Total Length of load, center & unload section is: 19.187 feet (overall length)
14. Standard Height
15. With Energy Recovery System
16. Service Labor Hours for Removal & Reinstall for Energy Recovery Shipped Loose: Required machine assembly by Hobart Service - for assembly within 100 miles of a Hobart Service Office during normal business hours, with appropriate notice; beyond 100 miles to be quoted by Hobart Service. Includes assembly of this item only, final electrical or plumbing connections by others. For prevailing wage, or projects in correctional /other secure areas, please contact the local service office in advance or project may be subject to additional fees billed at time of assembly.
17. Without Advansys Energy Recovery (Ventless Technology)
18. Electric Heat
19. (HV), with (1) electrical service connection

20. EHW - With Circuit Breaker, Electric, High Voltage, for machines With Blower Dryer
21. (1) Service Connection (refer to specifications sheet for rated amps)
22. With Circuit Breaker
23. Electric Booster
24. Standard Piping
25. Right to left operation
26. NOTE: Hobart suggests adding a water softener. Hobart recommends a total of 2 water softeners (one for the incoming hot water line, one for the incoming cold water line) for all Advansys Energy Recovery models.
27. Hinge doors, all sections
28. Without added security
29. Standard Conveyor
30. Without Cross Rods
31. Without SEF Options
32. Drain water tempering kit - NGFT
33. Installation of DWT kit only (NET)

ITEM #D10 SPARE NO.

ITEM #D11 SPARE NO.

ITEM #D12 HOSE REEL

Quantity: One (1)
Manufacturer: T&S Brass
Model: B-7143-05

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hose Reel, open, stainless steel, 1/2" x 50 ft. hose, 5/16" front trigger water gun

ITEM #D12.1 HOSE REEL CONTROL CABINET

Quantity: One (1)
Manufacturer: T&S Brass
Model: B-2339-LR

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hose Reel Control Cabinet, with control valve & temperature gauge & dual check valves

ITEM #D13 HAND SINK ASSEMBLY

Quantity: One (1)
Manufacturer: Eagle Group
Model: YHFL-5000-0013-00 (MOD)

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Hand Washing System, includes hand sink with integral (welded) left and right side splashes, splash mount gooseneck faucet with wrist handles, Emergency Eye Wash Unit, faucet-mount, fits in place of aerator on spout, (2) dust covers, pull valve activates fountain with Anti-Scald Valve, polished chrome finish touchless hand sanitizing dispenser, hands free soap dispenser, automated touchless paper towel dispenser, food handler glove rack, white bristle nail brush, with stainless steel skirt assembly in lieu of trash receptacle & end splashes on both ends, 304 stainless steel, NSF

ITEM #D14 TRASH RECEPTACLE, 23 GALLON; QTY: 2, N.I.K.E.C.- BY OWNER/OPERATOR

ITEM #D15 SPARE NO.

ITEM #D16 SPARE NO.

ITEM #D17 ACCUMULATOR

Quantity: One (1)
Manufacturer: Aerowerks
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

Provide As Follows:

1. Provide full perimeter window frame manufactured from 16 ga. stainless steel integral with Rotary Dishware Accumulator Conveyor. Food Service Equipment Contractor to verify window opening with jobsite conditions.
2. Provide stainless steel insulated sight & sound baffle with two (2) LED tube light.
3. Construction of sight & sound baffle enclosure shall be 18 ga. stainless steel double-walls, 2” thick with sound-reducing syro foam in between. Enclosure shall be mounted to Aerowerks conveyor and building wall by Aerowerks installers.
4. Rotary dishware accumulator conveyor:
    a. Each ladder shall include four (4) carriers. The carriers shall be constructed of 18 ga. stainless steel. Carriers shall be removable from carrier hanger without the use of tools.
    b. The carrier hangers shall be constructed of 1/2" stainless steel rods all welded and polished. The carrier hangers shall be attached to a stainless steel ‘J’ bracket. The carriers shall be removable without the use of tools.
    c. Brackets shall be formed from 12 ga. stainless steel. Brackets shall be attached to and driven by # 60 conveyor chain.
    d. The dishware carriers shall be driven by conveyor chain and sprockets. The drive mechanism shall be supported by stainless steel structural members fitted with stainless steel housing and access panels.
    e. Provide variable speed A.C. motor, with double reduction gearbox reducer. Speed shall be changed by turning speed control knob on control panel.
    f. Provide two (2) anti-jam photo sensors switch to shut off conveyor in the event the dishware are not fully loaded into the dishware carriers.

g. Provide UL Listed Main Control Center containing main disconnect, start-stop, speed control, and indicating lights. All components shall be neatly contained in a stainless steel watertight enclosure. All wiring shall conform to the latest UL standards. All enclosures for electrical components must be watertight.

5. Provide NSF Listed Soiled Dish Table, 14 ga. stainless steel top and trough as shown on plan. Table shall be formed with vertical and horizontal corners coved to a 3/4" radius. Provide two (2) perforated ledges, two (2) pre-rinse stations, two (2) mixing valve for pre-rinse stations, one (1) magnetic silver saver and one (1) remote start/stop station for TAC.
6. Trough shall be 9" wide sloping from 3" to maximum with matching at the trough collector mounted in the end of the trough. Furnish trough with connection for trough diffuser for water line. K.E.C. to provide water line mounted under waste trough from one end of trough to PRT waste collector.
7. Support table on 1-5/8" stainless steel legs with adjustable flanged feet. Legs shall be positioned to align up front-to-back for maximum access for cleaning. Legs shall be supported with 12 ga. stainless steel leg channels. All cross rails shall be fully welded to legs with all welds polished and ground smooth.
8 Provide NSF Listed Roller Conveyor as shown on plan. Roller conveyor shall be integrated into soiled dish table as specified on plan and connected to a dedicated rack-style dish machine. Rollers shall be 1.9" Ø blue PVC, fitted with polypropylene bearings with stainless steel balls. Rollers shall be spaced at approximately 4" centers. Shafts shall be 7/16" hexagon aluminum securely bolted to side rails. Side rails shall be 1/8" x 2" stainless steel resting on support pins welded to side of conveyor bed**.** Roller conveyor shall be mounted above surface of recessed table bed on stainless steel pins enabling the sections of the conveyor to be easily lifted out of recessed table bed for cleaning. Also, the drain will be along drain covers.
9 Provide one (1) Hose Clean Up Station as shown on drawings. Furnish unit with 30'-0" heavy duty dairy-quality hose and heavy duty front trigger style water gun and H & C mixing valves. Provide 14 ga. stainless steel swing bracket with leg mounting sleeve.

Special Instructions:
1. See "QF800" Series drawings for additional details and information.
2. Aerowerks shall be responsible for all interconnections of Electrical work required for conveyor system.
3. Final connections to building services shall be by others. Aerowerks shall install and adjust system to owner's satisfaction and shall provide adequate instructions to operating personnel.
4. Plumbing interconnections shall be by KEC.
5. Installation must be supervised by factory personnel or factory authorized personnel.

ITEM #D17.1 WASTE COLLECTOR - INCLUDED IN ITEM D17

Quantity: One (1)
Manufacturer: Aerowerks
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Provide with watertight cabling
2. Provide electrical shock prevention
3. Motor to be provided with overload protection
4. 24VDC Low Voltage Control Circuit

ITEM #D18 SPARE NO.

ITEM #D19 SPARE NO.

ITEM #D20 SPARE NO.

ITEM #D21 WORK TABLE, MOBILE

Quantity: Three (3)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Worktable, see plans for width, length, height, and configuration.
2. Standard details are to be utilized as basic minimum guidelines only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions. Similar to standard details FSD1-7 and FSD1-10.
3. Island work table with undershelf, similar to detail FSD2-6.
4. 5" Heavy-duty casters, two (2) with brakes.
5. Straight turn-down edge profile similar to detail FSD1-5A.

ITEM #D22 CORNER GUARD

Quantity: Four (4)
Manufacturer: Fabricated
Model: CUSTOM

Fabricate/Furnish and set-in place per plans, details, and the following:

1. Similar to standard detail FSD1-40. This standard detail is to be utilized as a basic minimum guideline only. Refer to these written specifications and any fabrication details included in the contract drawings for precise and complete fabrication instructions

SECTION 12 24 13 - ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 RELATED SECTIONS

A. Division 06 – Rough Carpentry: Wood blocking and grounds for mounting roller shades.

B. Division 09 – Gypsum Board

C. Division 09 – Acoustic Tile Ceilings

D. Division 26 – Electrical

1.3 REFERENCES

A. ASTM G 21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

B. NFPA 70 - National Electrical Code.

C. NFPA 701 - Fire Tests for Flame-Resistant Textiles and Films.

1.4 SUMMARY

A. The work performed under this Section includes the performance criteria, materials, production, and erection of roller window shades for the project and consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all window shades as required by schedules, keynotes and drawings, as specified herein, and as may be required by conditions and authorities having jurisdiction including, but not limited to the following:
   1. Manually operated roller shades with single rollers at all exterior windows including but not limited to, classrooms (computer lab), conference rooms, offices, dining room and all interior glazing and sidelites.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

1. Manual Roller Shades with chain pull.

C. Samples: For each exposed product and for each color and texture specified, 10 inches (250 mm) long.

D. Samples for Initial Selection: For each type and color of shadeband material.

1. Include Samples of accessories involving color selection.

E. Samples for Verification: For each type of roller shade.

1. Shadeband Material: Not less than 10 inches (250 mm) square. Mark inside face of material if applicable.
2. Roller Shade: Full-size operating unit, not less than 16 inches (400 mm) wide by 36 inches (900 mm) long for each type of roller shade indicated.
3. Installation Accessories: Full-size unit, not less than 10 inches (250 mm) long.

F. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Certificates: For each type of shadeband material, signed by product manufacturer.

C. Product Test Reports: For each type of shadeband material, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roller shades to include in maintenance manuals.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than ten units.

1.9 QUALITY ASSURANCE

A. Manufacturer Qualifications: Obtain roller shades system through one source from a single manufacturer with a minimum of ten years experience and minimum of five projects of similar scope and size in manufacturing products comparable to those specified in this section.

B. Installer for Roller Shade System - Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.

C. Fire-Test-Response Characteristics: Passes NFPA 701 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.

D. ShadeCloth Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.

E. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide:

1. Mechoshade Systems, Inc. – Mecho/5 Regular Roll Shade in 4133 Pocket manually operated single roller with Thermoveil screens - 1500 Series 3 % density at all exterior windows including but not limited to, classrooms (computer lab), conference rooms, offices, dining room and all interior glazing and sidelites. Shades are not required at exterior operable doors.

Or comparable product by one of the following:

2. BTX Window Automation, Inc.
3. DFB Sales.
4. Draper Inc.
5. Hunter Douglas Contract.
6. Lutron Electronics Co., Inc.

B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.

1. Bead Chains: Stainless steel.

a. Loop Length: Full length of roller shade.
b. Limit Stops: Provide upper and lower ball stops.
c. Chain-Retainer Type: Chain tensioner, jamb mounted.

2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller-shade weight and lifting heavy roller shades.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

1. Roller Drive-End Location: As directed during shop drawing review.
2. Direction of Shadeband Roll: Reverse, from front of roller.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.

E. Shadebands:

1. Shadeband Material: Translucent.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

a. Type: Exposed with endcaps.
b. Color and Finish: As selected by Architect from manufacturer's full range.

F. Shade Pocket: For mounting as indicated on the drawings.

1. Extruded aluminum shade pocket, sized to accommodate roller shades, with exposed extruded aluminum closure mount, tile support and removable closure panel to provide access to shades.
2. Basis of Design: 4133 surface mounted with endcaps, as per details.

G. Installation Accessories:

1. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
2. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
3. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 SHADEBAND

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Shade Bands: Construction of shade band includes the fabric, the enclosed hem weight, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets shall not be acceptable.
1. Concealed Hembar: Shall be continuous extruded aluminum for entire width of shade band and with the following characteristics:
a. Hembar shall be heat sealed on all sides.
b. Open ends shall not be accepted.
2. Shade band and Shade Roller Attachment:
a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection.
b. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" Spline mounting, without having to remove shade roller from shade brackets.
c. Mounting Spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
d. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets, does not meet the performance requirements of this specification and shall not be accepted.

C. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

1. Source: Roller-shade manufacturer.
2. Type: PVC-coated polyester.
3. Weave: Dense Vertical Weave.
4. Roll Width: 96 inches (244 mm).
5. Orientation on Shadeband: Up the bolt.

6. Openness Factor: 3 percent.
7. Color: As selected by Architect from manufacturer's full range.

D. Light-Blocking Fabric: Opaque fabric, stain and fade resistant.

1. Source: Roller-shade manufacturer.
2. Type: Acrylic-coated fiberglass.
3. Roll Width: 98 inches (249 mm).
4. Orientation on Shadeband: Up the bolt.
5. Features: Flame retardant and flame resistant.
6. Color: As selected by Architect from manufacturer's full range.

2.4 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):

1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch (6 mm) per side or 1/2-inch (13-mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).
2. Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:

1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4 provide battens and seams at uniform spacing along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.
2. Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than 2 inches (51 mm) to interior face of glass. Allow clearances for window operation hardware.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that roller shades are without damage or deterioration at time of Substantial Completion.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades.

3.6 WASTE MANAGEMENT

A. Coordinate with Section 01 74 19.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 12 24 13

SECTION 12 36 61 – SOLID SURFACING COUNTERTOPS

GENERAL

1.1 RELATED DOCUMENTS

Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the performance criteria, materials, production, and erection of simulated stone sill for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all simulated stone countertops as required by this section, schedules, keynotes and drawings, including, but not limited to the following:

Solid-surface-countertops

1.3 ACTION SUBMITTALS

A. Product Data: For Countertops

Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

C. Samples for Initial Selection: For each type of material exposed to view.

Samples for Verification: For the following products:

1. Material, 6 inches (150 mm) square.

1.4 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication is complete.

1.5 COORDINATION

A. Coordinate locations of penetrations.

PART 2 - PRODUCTS

2.1 SOLID-SURFACE-MATERIAL

Sills: 3/4-inch- (19-mm-) thick, solid surface material

B. Fabrication: Fabricate in one piece with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

COUNTERTOP MATERIALS

Adhesives: Adhesives shall not contain urea formaldehyde.

Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.

Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Caesarstone- Basis of Design QUARTZ
b. Dupont
c. Corian
d. Formica Corporation.
e. Wilsonart International.

Type: Provide Standard Type unless Special Purpose Type is indicated.

3. Colors and Patterns: As indicated by manufacturer's designations.

2.3 FACTORY FABRICATION

A. Shop assembly

1. Fabricate components to greatest extent practical to sizes and shapes indicated, in accordance with approved shop drawings and manufacturer’s printed instructions and technical bulletins.
2. Form joints between components using manufacturer’s standard joint adhesive joints.
   a. Reinforce as required.
3. Provide factory cutouts for plumbing fittings and bath accessories as indicated on the drawings.
4. Rout and finish component edges with clean, sharp returns.
   a. Rout cutouts, radii and contours to template.
   b. Smooth edges.

EXECUTION

3.1 INSTALLATION

A. Install countertops level to a tolerance of 1/8 inch in 8 feet (3 mm in 2.4 m).

B. Install countertops to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.

C. Keep components and hands clean during installation.
   1. Remove adhesives, sealants and other stains.
   2. Components shall be clean on date of substantial completion

3.2 WASTE MANAGEMENT

A. Coordinate with Division 01.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other metal scrap for recycling in designated area.

END OF SECTION 12 36 61

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SECTION 12 48 13 – ENTRANCE FLOOR MATS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This section includes the performance criteria, materials, production, and installation of entrance floor mats, including fibered roll goods, for the project. The work performed under this Section consists of the provision of all plant, materials, labor and equipment and the like necessary and/or required for the complete execution of all entrance floor mats as required by the this section.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: Submit selection and verification samples of the floor mats.

C. Product Schedule: Use same designations indicated on Drawings.

1.4 INFORMATION SUBMITTALS

A. Test and Evaluation Reports

1. Product test reports: As required by Conditions of the Contract and Division 1 Regulatory Requirements Section, submit test certificates from an independent test laboratory showing compliance with specified performance characteristics and physical properties.

2. Compatibility and adhesion test reports: Submit test reports confirming adhesive's effectiveness with the product(s) specified.

3. Manufacturer Instructions: For specified products, submit latest editions of product supplier's installation and cleaning & maintenance instructions.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of floor mat to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer: Installer shall be highly experienced in performing work of this section, having previous done fiber roll goods installation work similar to that required for this project.

B. Testing Agency: Agency(ies) shall be independent and qualified to perform the specified product tests.

1.7 DELIVERY, STORAGE, AND HANDLING

A. General: Comply with Division 1 Product Requirements Section

B. Delivery and Acceptance Requirements: Comply with the product supplier's ordering and lead time requirements to avoid construction delays, and to allow material to acclimatize as required in the specified product's installation instructions. Accept delivery of materials only if they are in unopened, undamaged packaging that bears the name and brand of the manufacturer/product supplier, project identification, and shipping and handling instructions.

C. Storage and Handling Requirements: Store material -- including any adhesive and accessories -- in the original packaging (as delivered) in areas that are enclosed and weather tight with the permanent HVAC system set at a temperature of between 65°F and 80°F for a minimum of 48 hours prior to commencement of installation. In addition, comply with storage and handling requirements listed on product packaging, and described in the latest edition of the product's installation instructions

1.8 FIELD CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F (21 deg C) or more than 80 deg F (35 deg C) during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

PART 2 - PRODUCTS

2.1 HEAVY TRAFFIC CARPET MATTING

A. Basis of Design: Subject to compliance with requirements, provide the product indicated on drawings or comparable product to the following:

1. "Step Repeat Collection" By Interface, Inc
2. Construction:

a. Tufted Textured Loop

Width: Recessed in flooring. Refer to finish plans.
Length: Recessed in flooring. Refer to finish plans.
Sizes: Custom – Refer to finish plans.

Weight: 26 ounces/square yard

b. Performance: Physical properties of the entrance matting shall conform to the following minimums:

Safety
Surface flammability ASTM D2859: Pass (equal to CPSC FF 1-70)

B. Colors: As selected by Architect.

C. Other Manufacturers- 3M Nomad by Mats Inc or Approved Equal

2.2 ACCESSORY PRODUCTS

A. Matting tape and adhesives as supplied by floor mat manufacturer for complete installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installation.

B. Interface with Other Work: If transitions are required to and/or from the specified entrance matting, contact Mats Inc. for suitable transition material.

C. Sizes: Where not indicated otherwise, provide single unit for each mat installation, but do not exceed manufacturer's maximum size recommendation for units intended for removal and cleaning. Where possible, verify sizes by field measurement before shop fabrication.

D. Accessory selection: Where indicated for recessed or wall-to-wall applications provide aluminum framework as recommended by manufacturer. Where indicated for surface-mounted applications, provide tapered vinyl moldings with flanges sewn to back of mat on all four sides with mitered corners.

3.3 CLEANING AND PROTECTION

A. General: Clean up job site, including sweeping or dust mopping the floor to remove all dirt or grit, and put all waste in general contractor's dumpster. Follow overall cleaning guidelines described in Division 01.

B. Maintenance: Conduct a full initial maintenance following the latest edition of the manufacturer's maintenance instructions. Instruct owner's cleaning staff in proper maintenance procedures.

3.4 WASTE MANAGEMENT

A. Coordinate with Section 01 74 23.

1. Separate and recycle cut-offs and waste materials and material packaging in accordance with Waste Management Plan and to the maximum extent economically feasible and place in designated areas for recycling.
2. Set aside and protect materials suitable for reuse and/or remanufacturing.
3. Separate and fold up metal banding; flatten and place along with other scrap for recycling.

END OF SECTION 12 48 13

SECTION 14 21 00 - ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Electric Traction Elevators.

B. Products Supplied But Not Installed Under this Section:

1. Hoist Beam
2. Pit Ladder
3. Inserts mounted in block walls for rail attachments

C. Work Supplied Under Other Sections:

1. Temporary lighting, including temporary lighting in hoistway for machine space with switch located in hoistway on the strike jamb side of top landing door.
2. Main line disconnects for each elevator.
   a. One fused three phase permanent power in building electrical distribution room
   b. One non fused three phase permanent power in hoist way at top landing
3. Hoistway ventilation shall be in accordance with local and national building code requirements.
4. Guide Rail Support shall be structurally adequate to extend from pit floor to top of hoistway, with spans in accordance with requirements of authority having jurisdiction and final layouts.
5. Removable barricades at all hoistway openings, in compliance with OSHA 29 CFR 1926.502 in addition to any local code requirements.
6. Lifeline attachments capable of withstanding 5000 lb load in accordance with OSHA 29 CFR 1926.502. Provide a minimum of 2 at the top, front of each hoistway.
7. Pit lighting: Fixture with switch and guards. Provide illumination level equal to or greater than that required by ASME A17.1/CSA B44 2000, or applicable version.
8. Control space lighting with switch. Coordinate switch with lighting for machine space as allowable by code.
9. Access Doors: As required for access to governor and/or seismic switch. Access door shall be self-closing, self-locking if necessary and operable from the inside without a key.

D. Related sections:

1. Section 01 50 00 - Temporary Facilities and Controls
2. Section 03 30 00 - Cast-in-Place Concrete:
3. Section 04 20 00 - Unit Masonry
4. Section 05 50 00 - Metal Fabrications

5. Division 7 – Thermal and Moisture Protection
6. Division 23 - Mechanical
7. Division 26 - Electrical
8. Division 27 - Communications
9. Division 28 – Electronic Safety and Security
10. Division 31 - Earthwork

E. Industry and government standards:

1. ICC/ANSI A117.1 Accessible and Usable Buildings and Facilities
2. ADAAG - Accessibility Guidelines for Buildings and Facilities
3. ANSI/NFPA 70, National Electrical Code
4. ANSI/NFPA 80, Standard for Fire Doors and Fire Windows
5. **ASME/ANSI A17.1-2022, Safety Code for Elevators and Escalators.**
6. **IBC 2024 code**

1.2 DESCRIPTION OF ELEVATOR – PASSENGER ELEVATOR

A. Elevator Equipment: KONE MonoSpace® 300 gearless traction elevator

B. Equipment Control: KCM831

C. Drive: Non Regenerative

D. Quantity of Elevators: 1

E. Landings: 2 landings. See drawings.

F. Openings: 2 Front Openings, 0 Back Openings

G. Travel: 12' 5 5/8". See drawings.

H. Rated Capacity: 2500 lbs

I. Rated Speed: 150 fpm

J. Clear Inside Dimensions (W x D): 8' 4" x 5' 9"

K. Cab Height: 7' 6"

L. Clear height under suspended ceiling: 7' 4"

M. Entrance Width and Type: 3' 6" and Side Opening

N. Entrance Height: 7' 0"

O. Main Power Supply: 208 V Volts + 5%, three-phase – Coordinate with Electrical work

P. Operation: Simplex

Q. Machine Location: Inside the hoistway mounted on car guide rail

R. Control Space Location: Integrated Controller

S. Elevator Equipment shall conform to the requirements of seismic zone: Non-seismic

T. Maintenance Service Period: 12 months

1.3 PERFORMANCE REQUIREMENTS

A. Car Performance

1. Car Speed ± 5% of contract speed under any loading condition or direction of travel.

2. Car Capacity: Safely lower, stop and hold (per code) up to 125% of rated load.

B. System Performance

1. Vertical Vibration (maximum): 15 mg

2. Horizontal Vibration (maximum): 12 mg

3. Jerk Rate (maximum): 1 m /sec3

4. Acceleration (maximum) .4 m/sec2

5. In Car Noise: = 55 dB(A)

6. Leveling Accuracy: ±0.2 inches

7. Starts per hour (maximum): 180

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's product literature for each proposed system.

1. Cab design, dimensions and layout.

2. Layout, finishes, and accessories and available options.

3. Controls, signals and operating system.

4. Color selection charts for cab and entrances.

B. Shop Drawings:

1. Clearances and travel of car.

2. Clear inside hoistway and pit dimensions.

3. Location and layout of equipment and signals.

4. Car, guide rails, buffers and other components in hoistway.

5. Maximum rail bracket spacing.

6. Maximum loads imposed on building structure.

7. Hoist beam requirements.

8. Location and sizes of access doors.

9. Location and details of hoistway door and frames.

10. Electrical characteristics and connection requirements.

C. Operation and maintenance data:

1. Provide manufacturer's standard maintenance and operation manual.

D. Diagnostic Tools

1. Prior to seeking final acceptance for the completed project as specified by the Contract Documents, the Elevator Contractor shall deliver to the Owner any specialized tool(s) that may be required to perform diagnostic evaluations, adjustments, and/or parametric software changes and/or test and inspections on any piece of control or monitoring equipment installed. This shall include any specialized tool(s) required for monitoring, inspection and/or maintenance where the means of suspension other than conventional wire ropes are furnished and installed by the Elevator Contractor. Any and all such tool(s) shall become property of the Owner. Any diagnostic tool provided to the Owner by the Elevator Contractor shall be configured to perform all levels of diagnostics, systems adjustment and parametric software changes which are available to the Elevator Contractor. In those cases where diagnostic tools provided to the Owner require periodic recalibration/or re-initiation, the Elevator Contractor shall perform such tasks at no additional cost to the Owner for a period equal to the term of the maintenance agreement from the date of final acceptance of the competed project During those intervals in which the Owner might find it necessary to surrender a diagnostic tool for re-calibration, re-initiation, or repair, the Elevator Contractor shall provide a temporary replacement for the tool at no additional cost to the Owner. The Elevator Contractor shall deliver to the Owner, printed instructions for the proper use of any tool that may be necessary to perform diagnostic evaluations, system adjustment, and/or parametric software changes on any unit of microprocessor-based elevator control equipment and means of suspension other than standard elevator steel cables furnished and install by the Elevator Contractor. Accompanying the printed instructions shall be any and all access codes, password, or other proprietary information that is necessary to interface with the microprocessor-control equipment.

1.5 QUALITY ASSURANCE

A. Manufacturer: Minimum of fifteen years experience in the fabrication, installation and service of elevators of the type and performance of the specified. The manufacturer shall have a documented quality assurance program.

B. Installer: The equipment manufacturer shall install the elevator.

C. Inspection and Testing: In accordance with requirements of local jurisdiction, obtain required permits, inspections and tests.

1.6 DELIVERY, STORAGE AND HANDLING

A. If the construction site is not prepared to receive the elevator equipment at the agreed ship date, the General Contractor shall be responsible to provide a safe, dry, and easily accessible storage area on or off the premises. Additional labor costs for double handling will be the responsibility of the general contractor.

B. Delivered elevator materials shall be stored in a protected environment in accordance with manufacturer recommendations. A minimum storage area of 10 feet by 20 feet is required adjacent to the hoistway.

1.7 WARRANTY

A. Provide manufacturer warranty for a period of one year. The warranty period is to begin upon Substantial Completion of the Contract. Warranty covers defects in materials and workmanship. Damage due to ordinary use, vandalism, improper or insufficient maintenance, misuse, or neglect do not constitute defective material or workmanship.

1.8 MAINTENANCE SERVICE

A. The elevator manufacturer shall provide maintenance service consisting of regular examinations and adjustments of the elevator equipment for a period of 12 months after date of substantial completion. Replacement parts shall be produced by the original equipment manufacturer.

B. Maintenance service be performed during regular working hours of regular working days and shall include emergency 24-hour call back service.

C. Maintenance service shall not include adjustments, repairs or replacement of parts due to negligence, misuse, abuse or accidents.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Provide AC gearless machine room-less elevator systems subject to compliance with the design and performance requirements of this specification. Elevator manufacturers may include but are not limited to one of the following:

1. Basis of Design: MonoSpace® 300 traction elevators by KONE, Inc. (www.kone.com).

2. Other acceptable machine room-less products: manufacturer with minimum 15 years experience in manufacturing, installing, and servicing elevators of the type required for the project.

2.2 EQUIPMENT: CONTROL COMPONENTS AND CONTROL SPACE

A. Controller: Provide microcomputer based control system to perform all of the functions.

1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.

2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed and physically segregated from the rest of the controller.

3. Provide a serial cardrack and main CPU board containing a non-erasable EPROM and operating system firmware.

4. Variable field parameters and adjustments shall be contained in a non-volatile memory module.

B. Drive: Provide Variable Voltage Variable Frequency AC drive system to develop high starting torque with low starting current.

C. Controller Location: Locate controller{s} in the front wall integrated with the top landing entrance frame, machine side of the elevator. A separate control space should not be required.

2.3 EQUIPMENT: HOISTWAY COMPONENTS

A. Machine: AC gearless machine, with permanent magnet synchronous motor, direct current electro-mechanical disc brakes and integral traction drive sheave, mounted to the car guide rail at the top of the hoistway.

B. Governor: Friction type over-speed governor rated for the duty of the elevator specified.

C. Buffers, Car and Counterweight: Polyurethane buffer.

D. Hoistway Operating Devices:

1. Emergency stop switch in the pit

2. Terminal stopping switches.

3. Emergency stop switch on the machine

E. Positioning System: System consisting of magnets and proximity switches.

F. Guide Rails and Attachments: Steel rails with brackets and fasteners.

2.4 EQUIPMENT: HOISTWAY ENTRANCES

A. Hoistway Entrances

1. Sills: extruded.

2. Doors: Hollow metal construction with vertical internal channel reinforcements.

3. Fire Rating: Entrance and doors shall be UL fire-rated for 1-1/2 hour.

4. Entrance Finish: Brushed Stainless Steel.

5. Entrance Markings Jamb Plates: Provide standard entrance jamb tactile markings on both jambs, at all floors. Plate Mounting: Refer to manufacturer drawings.

2.5 EQUIPMENT: CAR COMPONENTS

A. Car Frame: Provide car frame with adequate bracing to support the platform and car enclosure.

B. Platform: Platform shall be all steel construction.

C. Car Guides: Provide guide-shoes mounted to top and bottom of both car and counterweight frame. Each guide-shoe assembly shall be arranged to maintain constant contact on the rail surfaces. Provide retainers in areas with Seismic design requirements.

D. Steel Cab

1. Panels: Non-removable vertical panels, plastic laminate selected from standard manufacturer's catalog of choices.

2. Car Front Finish: Brushed stainless steel.

3. Car Door Finish: Brushed stainless steel.

4. Ceiling:

   a. Round LED Down Light Drop Ceiling - LF-88: Satin Finished Stainless Steel three panel suspended ceiling with two holes per panel for Round LED lights.

5. Handrail:

   a. Round tube brushed aluminum - 1.5 in.. Rails to be located on back wall of car enclosure.

6. Flooring: By others. (Not to exceed 3lb/sqft and 1/2" finished depth.)

7. Threshold: Aluminum

E. Emergency Car Signals

1. Emergency Siren: Siren mounted on top of cab that is activated when the alarm button in the car operating panel is engaged. Siren shall have rated sound pressure level of 80 dB(A) at a distance of three feet from device. Siren shall respond with a delay of not more than one second after activation of alarm button.

2. Emergency Car Lighting: Provide emergency power unit employing a 12-volt sealed rechargeable battery and totally static circuits shall illuminate the elevator car and provide current to the alarm bell in the event of building power failure.

3. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.

F. Ventilation: No fan.

2.6 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

A. Car Operating Panel: Provide car operating panel with all push buttons, key switches, and message indicators for elevator operation.

1. Flush mounted car operating panel shall contain a bank of round, mechanical, illuminated buttons marked to correspond to landings served, emergency call button, door open button, door close button, and key switches for lights, inspection, and exhaust fan. Buttons have amber illumination (halo). All buttons to have raised text and Braille marking on left hand side. The car operating display panel shall be amber DOT-matrix. All texts, when illuminated, shall be amber. The car operating panel shall have a brushed stainless steel finish.

2. Additional features of car operating panel shall include:

   a. Car Position Indicator within operating panel (amber).

   b. Elevator Data Plate marked with elevator capacity and car number on car top.

   c. Help buttons with raised markings.

   d. In car stop switch per local code.

e. Firefighter's hat.

f. Firefighter's Phase II Key-switch.

g. Call Cancel Button.

h. Pre-programmed integrated ADA phone (complete description of krms features included as standard)

i. Help Button/Communicator. Activation of help button will initiate two-way communication between car and a location inside the building, switching over to alternate location if call is unanswered, where personnel are available to take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.

j. Firefighter's Phase II emergency in-car operating instructions.

B. Required: Two-Way Communication Device (**RATH Smartview Two-way system- Basis of Design)** which meets the intent of **IBC 2024 and ASME A17.1 2022** code. To provide two-way text-based two-way communication between the elevator cab and the monitoring center as well as means to visually verify if the cab is occupied when an emergency call is placed. Dedicated data line to be run to elevator for this specific feature by others. To be built into side wall in the field.

C. Hall Fixtures: Wall mounted hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Wall mounted hall fixtures shall have a brushed stainless steel finish.

1. Hall fixtures shall feature round, mechanical, buttons in applied mount face frame. Hall fixtures shall correspond to options available from that landing. Buttons shall be in a vertically mounted fixture. Hall fixtures shall not be jamb-mounted. Hall lanterns shall feature amber illumination.

D. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound. The chime will sound once for up and twice for down.

E. Combination Hall Position Indicator and Hall Lantern located at Lobby. Hall lanterns and hall indicators shall feature amber illumination, all numbers will be amber display.

2.7 EQUIPMENT: ELEVATOR OPERATION AND CONTROLLER

A. Elevator Operation

1. Simplex Collective Operation: Using a microprocessor-based controller, operation shall be automatic by means of the car and hall buttons. If all calls in the system have been answered, the car shall park at the last landing served.

2. Zoned Car Parking.

3. Relative System Response Dispatching.

B. Standard Operating Features to include:

1. Full Collective Operation

2. Fan and Light Control.

3. Load Weighing Bypass.

4. Ascending Car Uncontrolled Movement Protection

5. Top of Car Inspection Station.

C. Additional Operating Features to include:

1. Emergency Battery Power Supply

a. When the main line power is lost for longer than 5 seconds the emergency battery power supply provides power automatically to the elevator controller. The elevator will rise or lower to the first available landing, open the doors, and shut down. The elevator will return to service upon the return of normal main line power. An auxiliary contact on the main line disconnect and shunt trip breaker (if used) will be provided by others.

D. Elevator Control System for Inspections and Emergency

1. Provide devices within controller to run the elevator in inspection operation.

2. Provide devices on car top to run the elevator in inspection operation.

3. Provide within controller an emergency stop switch to disconnect power from the brake and prevents motor from running.

4. Provide the means from the controller to mechanically lift and control the elevator brake to safely bring car to nearest available landing when power is interrupted.

5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.

6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.

7. Provide the means for the control to reset elevator earthquake operation.

2.8 EQUIPMENT: DOOR OPERATOR AND CONTROL

A. Door Operator: A closed loop permanent magnet VVVF high-performance door operator shall be provided to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlock shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.

B. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Emergency devices and keys for opening doors from the landing shall be provided as required by local code.

C. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.

D. Door hangers and tracks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation

with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.

E. Electronic Door Safety Device. The elevator car shall be equipped with an electronic protective device extending the full height of the car. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Field measure and examine substrates, supports, and other conditions under which elevator work is to be performed.

B. Do not proceed with work until unsatisfactory conditions are corrected.

C. Prior to start of Work, verify hoistway is in accordance with shop drawings. Dimensional tolerance of hoistway from shop drawings: -0 inches +2 inches. Do not begin work of this section until dimensions are within tolerances.

D. Prior to start of Work, verify projections greater then 2 inches (4 inches if ASME A17.1/CSA B44 2000 applies) must be beveled not less then 75 degrees from horizontal.

E. Prior to start of Work, verify landings have been prepared for entrance sill installation. Traditional sill angle or concrete sill support shall not be required.

F. Prior to start of Work, verify elevator pit has been constructed in accordance with requirements, is dry and reinforced to sustain vertical forces, as indicated in approved submittal. Verify that sumps or sump pumps located within pit will not interfere with installed elevator equipment.

G. Prior to start of Work, verify control space has been constructed in accordance with requirements, with access coordinated with elevator shop drawings, including Sleeves and penetrations.

H. Verify installation of GFCI protected 20-amp in pit and adjacent to each signal control cabinet in control space.

3.2 PREPARATION

A. Coordinate installation of anchors, bearing plates, brackets and other related accessories.

3.3 INSTALLATION

A. Install equipment, guides, controls, car and accessories in accordance with manufacturer installation methods and recommended practices.

B. Properly locate guide rails and related supports at locations in accordance with manufacturer’s recommendations and approved shop drawings. Anchor to building structure using isolation system to minimize transmission of vibration to structure.

C. All hoistway frames shall be securely fastened to fixing angles mounted in the hoistway. Coordinate installation of sills and frames with other trades.

D. Lubricate operating system components in accordance with manufacturer recommendations.

E. Perform final adjustments, and necessary service prior to substantial completion.

3.4 CONSTRUCTION

A. Interface with Other Work:

1. Guide rail brackets attached to steel shall be installed prior to application of fireproofing.

2. Coordinate construction of entrance walls with installation of door frames and sills. Maintain front wall opening until elevator equipment has been installed.

a. Ensure adequate support for entrance attachment points at all landings.

b. Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Each elevator requires sleeves within the hoistway wall.

c. Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet in each group.

d. Coordinate interface of elevators and fire alarm system.

e. Coordinate interface of dedicated telephone line.

f. Coordinate the installation of the non fused three phase permanent power disconnect in hoist way at top landing

3.5 TESTING AND INSPECTIONS

A. Perform recommended and required testing in accordance with authority having jurisdiction.

B. Obtain required permits and provide originals to Owner’s Representative.

3.6 DEMONSTRATION

A. Prior to substantial completion, instruct Owner’s Representative on the proper function and required daily maintenance of elevators. Instruct personnel on emergency procedures.

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SECTION 149300 - TWO-WAY COMMUNICATION SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes two-way communication equipment for the following:
   1. Elevator Emergency Communications System
      a. Audible Communication Device
      b. Emergency Communication Failure
      c. Visual Communication Device
      d. Equipment Locations: Refer to drawings.

1.03 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

B. ALL División 14 Specification Sections.

1.04 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.

B. ICC A117.1-2009 Accessible and Usable Buildings and Facilities.

C. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

D. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2015.

E. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.05 ADMINISTRATIVE REQUIREMENTS

A. Coordination:
   1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment or other potential obstructions within the spaces dedicated for two-way communication assistance system components.
   2. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

B. Sequencing:
   1. Do not install call stations and control station(s) until final surface finishes and painting are complete.

1.06 SUBMITTALS

A. Product Data: Provide manufacturer's standard catalog pages and data sheets for each system component. Include configurations, standard wiring diagrams, dimensions, finishes, service condition requirements, and installed features.

B. Shop Drawings: Include plan views indicating locations of system components and proposed size, type, and routing of conduits and/or cables. Include system interconnection schematic diagrams.

C. Field quality control test reports.

D. Operation and Maintenance Data: Include detailed information on system operation, equipment setup, replacement parts, and recommended maintenance procedures and intervals.

E. Executed Warranty: Submit documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.07 QUALITY ASSURANCE

A. Comply with the following:
   1. ADA Standards.
   2. NFPA 70 (National Electrical Code).
   3. Applicable TIA/EIA standards.

B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.08 DELIVERY, STORAGE AND HANDLING

A. Deliver products in manufacturer's original packaging. Store materials in a dry, protected, well-vented area. Inspect product upon receipt and report damaged material immediately to delivering carrier and note such damage on the carrier's freight bill of lading.

1.09 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's standard warranty. Materials shall be free of defects in material and workmanship for a period of two years or more from the date of purchase. Should a part fail to function in normal use within this period, manufacturer shall furnish a new part at no charge.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Elevator Emergency Communications System (Audio/Video/Text System)
   1. Audio/Video/Text System-Required Design Manufacturer:
      a. RATH® Communications
      b. N56 W24720 North Corporate Circle Sussex, WI 53089
      c. www.rathcommunications.com
      d. SmartView 2 system

2.02 ELEVATOR EMERGENCY COMMUNICATIONS SYSTEM

A. Complete Elevator Emergency Communication System
   1. Provide manufacturer components as specified and required for a complete audio/text/visual emergency elevator communication system.
   2. Provide all licensing and subscription costs as required for installation and to continue through the completion of the warranty period.
   3. Rath installation connectivity shall be required to be programmed to use a static IP address and DNS as assigned by SUNY Campus network administrators. The use of DHCP or Cellphone networks will **not** be allowed for connectivity.
   4. Please note for best practice it is recommended to use internal DNS rather than a Google DNS.

B. Security Desk Equipment Integration
   1. Operation Requirements: Confirm user access to the following elevator cab operations:
      a. Onsite and offsite audio capabilities.
      b. Video/Text functionality and screen.
   2. Performance Requirements:
      a. The emergency communications shall comply with the Americans with

Disabilities Act (ADA).

b. Campus Police Security desk equipment shall have a visual means to see passengers inside the elevator car and communicate with them through text-based communications.

c. Provide programming as required to interface with Elevator Emergency Communication Systems
   a) Audio communication
   b) Text Based Communication
   c) Video Communication

C. Machine Room Device
1. Basis of Design:
   a. SmartView 2 Machine Room Station Handset
      1) Locate in machine room serving. Refer to drawings.
   b. The Machine Room Station must allow calls out on analog, digital, cellular, or IP communication lines.
      1) VOIP Line will be used on this project.

D. Elevator Cab Audible Device
1. Basis of Design: Integrated into car operating panel with faceplate surface push button
E
1. Summary
   a. An Elevator Phone shall be located in each elevator.
   b. The Elevator Phone shall comply with the Americans with Disabilities Act (ADA). The elevator phones shall have the ability to be programmed with up to 5 emergency phone numbers. Upon activation of the emergency push button, a call will automatically be placed to an emergency location, if no answer it must try the number again or dial a secondary location (up to five locations). Elevator Phones must continue calling until answered and two-way off-site person-to-person voice communications has been established.
   c. The Elevator Phone must be programmable to check the status of the incoming telephone line every 10 minutes up to every 23 hours. Upon failure to detect an active telephone line the elevator phone must provide a relay contact to an Annunciator Device located at the designated landing in the vicinity of the “fire recall switch”. Must function on analog, digital, cellular, or VoIP communication lines and allow for “communication failure” alarm.
   d. Elevator Phone must allow for calls out on analog, digital, cellular, or IP communication lines.
3. Construction
   a. The Elevator Phone shall be 24vac/dc or 120vac powered and include a rechargeable battery to maintain backup power for a minimum of 4 hours of talk time.
   b. Elevator phone shall be mountable behind a COP.
   c. Behind the COP phones will line up with elevator company speaker grill, microphone hole, and be compatible with their push button, LED, and Braille label.

d. The Elevator Phone must be in full compliance with the Americans with Disabilities Act (ADA). Elevator Phones require a hands-free speakerphone with an LED to indicate status of a call.

e. The Elevator Phone must allow the programming in of a specific voice message indicating the location of the elevator.

f. The Elevator Phone must be programmable to check the status of the incoming telephone line every 10 minutes up to every 23 hours. Upon failure to detect an active telephone line the Elevator Phone must provide a relay contact to an Annunciator Device located at the designated landing in the vicinity of the “fire recall switch”.

g. The Elevator Phones must light an LED. LED shall be solid upon phone activation and blinking upon call answered.

4. Electrical

a. Elevator Phones must have battery backup capable of providing up to 4 hours of electrical backup in case of building power failure.

b. Elevator Phones must be powered either from COP provided 24vac/dc power or 120vac with a step-down transformer.

5. Communications

a. The Elevator Phone shall be an ADA compliant and vandal resistant speakerphone.

b. The Elevator Phone shall be compatible with analog, digital, cellular, and IP phone lines and maintain full code compliance.

c. The Elevator Phone shall be hands-free and be a push-button-once to talk system. Once the button has been pushed, the Elevator Phone will automatically call up to 5 pre-programmed emergency numbers.

d. The Elevator Phone shall have location message capability. Elevator Phone must include a minimum of 18 second recordable message, programmable to play 1 or 2 times. Elevator Phone shall notify called party of the location of the elevator upon receipt of call.

e. The Elevator Phone shall be capable of allowing the called party to replay the location message if necessary to ensure an understanding of the elevator’s location.

f. If the building location does not have a 24/7 attendant on duty, the Elevator Phone must dial a location outside the building.

g. Once call has been made (button pushed), the call can only be terminated by the called party.

h. The Elevator Phone must have a red LED that will light up upon push of the button. The light shall be a solid color when the Elevator Phone is activated and will flash when call has been answered.

i. The elevator phone must be capable of being programmed and re-programmed on-site and remotely.

j. Standard Elevator Phone features:

1) Five number programming
2) Location message
3) Telephone line verification
4) Standard analog or digital telephone input
5) Cellular communication option
6) IP phone line input
7) Battery backup (4 hours)

8) On-site or remote programmable
9) EEPROM memory to protect programming.

E. Emergency Communication Visual Device
1. Basis of Design: Rath SmartView 2 Visual Communication System including but not limited to the following components:
a. Corner Mounted Camera part No. 210-SVCF-CM. (The use of integral base unit mounted camera for video is **not** allowed.)
b. Machine Room Box Controller
c. Combined COP Text Screen and Car Position Indicator
d. HD IP Camera
e. Ethernet
2 Extenders Summary
a. Machine Room Box Controller Board, Display, remotely viewable Camera, and dedicated Yes / No buttons are to be installed in each elevator. The display is to be mounted on the same COP as the emergency phone call button along with the Yes / No buttons and the camera may be mounted in the COP or ceiling mounted.
b. Display and Camera along with the Yes / No buttons will be interfaced with the Controller and shall allow for both remote access via the internet or with additional components allow for a fully Intranet (LAN) based interaction (requires special software in SmartView Controller). Each Controller must have a unique ID to allow for secure access by authorized personnel and location identification. This ID is to be recorded into the location message of the Phone located in the elevator or noted in the account by the “monitoring” company.
c. When the elevator phone is activated and no response is heard by the operator, the operator must be able to view the camera in the car to verify if it is occupied and be able to send a message to the display if the occupant is deaf or has difficulties hearing. The occupant can respond Yes or No using the dedicated buttons.
d. For buildings 60’ and over a central control point must be installed that allows for both verbal and visual communication back to the car.
e. System thru the Extenders must be plugged into a backed up 120v power source or an auxiliary power unit.
3. Construction
a. The Controller shall have input connections for a Display, Camera, Yes / No buttons and power. It shall provide an output connection for the internet communication.
b. The Controller, Camera, Display and buttons shall operate in a minimum temperature range of 32˚F to 158˚F (0˚C to 70˚C).
c. The display shall have black text on a white background.
d. The display shall have 3/16” text height minimum and adjust up to 5/8”.
e. The Yes and No buttons shall require no more than 5lbs of force to activate.
f. Components shall be installed integral to car operation panel.
1) Surface mounted sub-panels will not be accepted.
2) Provide low voltage power as required by Rath to all system components.

4 Electrical
a. The Controller must be powered from a backed-up power source through the connection to the machine room via the Extenders or a connection to a PoE+ switch.
b. The Display shall be powered by the Controller.
c. The Camera shall be powered by the Controller.

5. Communications
a. The Phone shall be activated when the emergency phone push button is pressed.
b. The Phone shall include the unique SmartView Controller ID in its pre-recorded message.
c. Once the ID is accessed by authorized personnel; the Controller, Camera, and Display will be activated and begin to transmit data.
1) An open message input field shall be available to the call center personnel to allow for adaptive messaging.
2) In the same viewport the camera shall be viewable to allow for messages and camera viewing to be done simultaneously.
d. Occupant responses shall be displayed to authorized personnel and the occupant.
e. If the authorized personnel dispatches assistance, a message shall be sent stating, “Help is on the way” to notify the occupant in the elevator.
f. Messages sent by authorized personnel must be in a simple format where a Yes or No response can be given by the occupant.
g. Once the call has been made (button pushed). The call, camera stream, and display stream can only be terminated by the called party.
h. The SmartView Controller must be capable of being activated on-site and remotely.
i. A network connection with unrestricted access to the internet must be provided for communication to the monitoring of the system.
j. SUNY Campus will supply the internet connection and will also supply IP address, SUBnet mask, Gateway and DNS. The installer must use the following DNS IP addresses during Rath 2 setup.
1) DNS: 137.140.1.102 and/or
2) DNS:137.140.1.98

6. Graphics
a. Yes and No response buttons shall be properly identified in the COP panel.
b. If the display is not being used for any other function it shall remain off or show a black screen in an idle state.

F. Elevator Emergency Communication Failure
1. Basis of Design: Communication Failure
2. Summary
a. The Alarm Annunciator is to be located at the designated landing in the vicinity of the FIRE RECALL SWITCH. It shall include both an audible and visual signal.
b. The Alarm Annunciator shall comply with the Americans with Disabilities Act (ADA). The Alarm Annunciator shall have the ability to silence the audible alarm only (with a momentary key switch), the visual signal shall not reset unless an active phone line is detected. The audible signal must resound

within a 24-hour period if a phone line has not been restored.

c. The Alarm Annunciator is to work in conjunction with the elevator phone.

3. Construction

a. The Alarm Annunciator shall be 24vac/dc powered.

b. The Alarm Annunciator shall be mountable behind the landing panel, flush mounted, or surface mounted.

c. The Alarm Annunciator shall be available in both brushed and mirrored finish in either Stainless Steel or Antique Bronze finish. Available in either horizontal or vertical mount.

d. The Alarm Annunciator must include an LED, an audible Piezo buzzer, a momentary key switch, alarm, and junction board.

e. The Alarm Annunciator must be in full compliance with Americans with Disabilities Act (ADA).

f. The elevator phones must be programmable to check the status of the incoming telephone line every 10 minutes up to every 23 hours. Upon failure to detect an active telephone line, the elevator phone must provide a relay contact to the Alarm Annunciator located at the designated landing in the vicinity of the “FIRE RECALL SWITCH”.

4. Electrical

a. The Alarm Annunciator must be powered from a 24vac/dc power source.

5. Communications

a. The Alarm Annunciator shall be an ADA compliant and vandal resistant device.

b. The Alarm Annunciator must communicate a phone line detection failure with both an audible and visual indicator.

c. The Alarm Annunciator audible alarm shall have the ability to be silenced with the use of a momentary key switch. The audible alarm shall remain silenced no longer than a 24-hour period unless an active phone line has been detected by the elevator phone.

d. The Alarm Annunciator visual indicator can only be silenced when the elevator phone has detected an active phone line.

e. The Alarm Annunciator must have a LED and momentary key switch.

f. Standard alarm annunciator features:

1) Audible signal
2) Visual signal
3) Momentary key switch input
4) Behind panel, surface, or flush mount
5) 24vac/dc power

6. Graphics

a. The Alarm Annunciator wording must be “Elevator Communications Failure” in red lettering.

G. Ancillary Elevator Controller Equipment

1. Ethernet Extenders (as recommended by the Manufacturer)

2. UPS Power Supply

a. Communication equipment shall be provided with UPS battery backup as required for code compliance.

b. Where UPS is not integral to communication equipment, install mounting shelf adjacent to controller to support UPS.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify that the characteristics of system components are consistent with the indicated requirements.

C. Verify that mounting surfaces are ready to receive system components.

D. Verify that conditions are satisfactory for installation prior to starting work.

3.0 INSTALLATION

A. Perform work in accordance with NECA 1 (general workmanship).

B. Install products in accordance with the manufacturer's instructions.

C. Rath system installer shall be required to be trained by Rath/Janus as required and shall use a laptop to configure/test/program the unit. SUNY Campus network administrators shall not be required to assist with set-up.

D. Installer/Technician is to have a laptop with an ethernet port for pairing and programming the devices.

E. Units are to be paired and programed locally (right next to each other) before installing them in their respective locations.

F. All cables/wires are to be labeled and equipment must be mounted securely. Terminations must be approved industry standard.

G. Provide all programming and Owner support as required to integrate into the campus SmartView communication system.

H. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

3.0 FIELD QUALITY CONTROL

A. Provide ALL contractor coordination and Owner training as may be required for operational needs. Minimum (2) two-hour training periods required.

B. Test to verify wiring is free of shorts and grounds.

C. Prepare and start the system in accordance with the manufacturer's instructions.

D. Test the system for proper operation.

E. Rath system installer shall be required to use an “Installer Account” provided by Rath to properly test video and text function without additional assistance from SUNY Campus. Installer is to provide username and password to the Owner.

F. Correct defective work, adjust for proper operation, and retest until the entire system complies with Contract Documents.

G. Submit detailed reports indicating inspection and testing results and corrective actions taken.

3.04 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate proper operation of system to the Owner, and correct deficiencies or make adjustments as directed.
B. Wiring diagrams of systems are required for closeout.

END OF SECTION 149300

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SECTION 21 05 24 - BACKFLOW PREVENTERS

PART 1 - GENERAL

1.1 SUBMITTALS

A. Product Data:

1. Manufacturer's catalog sheets, specifications, and installation instructions for each type backflow preventer and test kit.

1.2 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with the New York State Department of Health for Cross Connection Control, and the other standards listed in Part 2 of this section.

2. Where conflicts occur between the referenced standards, the most stringent requirements shall apply.

1.3 MAINTENANCE

A. Special Tools (as furnished or recommended by the backflow preventer manufacturer). Deliver to the Owner's Representative:

1. Test Kit B: Sight tube, of required length, for testing backflow preventer for proper operation, and printed procedure for conducting test.

PART 2 - PRODUCTS

2.1 BACKFLOW PREVENTERS

A. Reduced-Pressure-Zone Backflow Preventer, conforming to ASSE Standard 1013, AWWA C-511, USC specifications manual for Cross Connection control, and listed as acceptable in the New York State Department of Health, Environmental Health manual.

1. Performance: 175 psig, and 130 degrees F, maximum working conditions. The maximum pressure drop across the backflow preventer shall not exceed the value included in the contractor's approved hydraulic calculations which conform to the requirements for a minimum safety margin as described in the specifications.

2. Assembly: Gate valve on inlet side, gate valve on outlet side, and four test cocks, all as furnished or recommended by the backflow preventer manufacturer.

3. Ames, Watts, or Zurn.

2.2 BACKFLOW PREVENTER TEST CONNECTION

A. Provide downstream of the main backflow prevention assembly UL 668 hose valves with 2.5 inch National Standard male hose threads with cap and chain. Provide one valve for each 250 gpm of system demand and round up to the next quantity where required. For example, a system with a flow demand of 251 gpm shall be provided with two hose valves.

B. Provide Placard adjacent to test connection which states “BACKFLOW PREVENTER TEST VALVE.” Placard text shall be red with a white background. Text height shall be 1”.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install the Work of this section in accordance with the manufacturer’s printed installation instructions.

B. Atmospheric Vent: Pipe vent to spill over closest point of drainage, as directed, maintaining a minimum 12 inch air gap above the drain.

3.2 BACKFLOW PREVENTION ASSEMBLY FORWARD FLOW TEST

A. Each backflow prevention assembly shall be tested at system flow demand, including all applicable hose streams, as specified in NFPA 13. The Contractor shall provide all equipment and instruments necessary to conduct a complete forward flow test, including 2.5 inch diameter hoses, playpipe nozzles, calibrated pressure gauges, and pilot tube gauge. The Contractor shall provide all necessary supports to safely secure hoses and nozzles during the test. At the system demand flow, the pressure readings and pressure drop (friction) across the assembly shall be recorded. A metal placard shall be provided on the backflow prevention assembly that lists the pressure readings both upstream and downstream of the assembly, total pressure drop, and the system test flow rate determined during the preliminary testing. The pressure drop shall be compared to the manufacturer’s data and the readings observed during the final inspections and tests.

3.3 FIELD QUALITY CONTROL

A. Operation Test: Test kit as specified under Part 1 of this section may be used. Conduct test in the presence of the Owner’s Representative.

1. Type B Backflow Preventer: Test the device with the test kit in accordance with the manufacturer’s test procedure.

B. Re-testing: Repair or replace any device failing the operation test, and repeat the test.

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SECTION 21 05 29 - PIPE HANGERS AND SUPPORTS

PART 1 - GENERAL

1.1 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Companion high density filler pieces for installation over the top 180 degree surface of pipe or tubing, at points of support where a combination clevis hanger, insulation shield and high density insulating saddle are installed.

1.2 SUBMITTALS

A. Shop Drawings:

1. Details of trapeze hangers and upper hanger attachments for piping 4 inches in diameter and over. Include the number and size of pipe lines to be supported on each type of trapeze hanger.

B. Product Data: Catalog sheets, specifications and installation instructions for each item specified except fasteners.

C. Quality Control Submittals

1. Company Field Advisor Data:
   a. Name, business address and telephone number of Company Field Advisor secured for the required services.
   b. Certified statement from the Company listing the qualifications of the Company Field Advisor.
   c. Services and each project for which authorization is given by the Company, listed specifically for this project.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:
1. Comply with the applicable requirements of the ASME B31 Piping Codes.
2. Unless otherwise shown of specified, comply with the requirements of the Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS) Standards SP-58, and SP-69
3. Materials for use in Sprinkler Systems comply with the requirements of NFPA 13.

PART 2 - PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Pipe hangers: Height adjustable standard duty clevis type, with cross bolt and nut.
1. Swivel ring type hangers will be allowed for sprinkler piping up to a maximum of 2 inches in size.

B. Adjustable Floor Rests and Base Flanges: Steel.

C. Hanger Rods: Mild, low carbon steel, fully threaded or threaded at each end, with two nuts at each end for positioning rod and hanger, and locking each in place.

D. Riser Clamps: Malleable iron or steel.

2.2 ANCHORS AND ATTACHMENTS

A. Sleeve Anchors (Group II, Type 3, Class 3): Molly's Div./USM Corp. Parasleeve Series, Ramset's Dynabolt Series, or Red Head/Phillips AN, HN, or FS Series.

B. Wedge Anchors (Zince Plated, Group II, Type 4, Class 1): Hilti's Kwik Bolt Series, Molly's Div./USM Corp. Parabolt PB Series, Ramset's Trubolt T Series, or Red Head/Phillips WS Series.

C. Self-Drilling Anchors (Group III, Type 1): Ramset's RD Series, Red Head/Phillips S Series, or Hilti.

D. Non-Drilling Anchors (Group VIII, Type 1): Ramset's Dynaset DS Series, Hilti's HDI Series, or Red Head/Phillips J Series.

E. Stud Anchors (Group VIII, Type 2): Red Head/Phillips JS Series, Ramset, or Hilti.

F. Beam Clamps: Forged Steel Beam Clamp, with weldless eye nut (right hand thread, steel tie rod, nuts, and washers, Grinnell, Tolco, Sammy, ANVIL or equivalent.

G. Metal Deck Ceiling Bolts: B-Line Systems, Grinnell, Tolco, Sammy, ANVIL or equivalent.

H. Continuous Slotted Type Concrete Insert, Galvanized:
   1. Load Rating 800lbs/ft: Grinnell, Tolco, Sammy, ANVIL or equivalent.
   2. Load Rating 1500 lbs/ft: Grinnell, Tolco, Sammy, ANVIL or equivalent.
   3. Load Rating 3000 lbs/ft: Grinnell, Tolco, Sammy, ANVIL or equivalent.
   4. Load Rating 4500 lbs/ft: Grinnell, Tolco, Sammy, ANVIL or equivalent.

I. Threaded Type Concrete Insert: Galvanized ferrous castings, internally threaded to receive ¾ inch diameter machine bolts.

J. Wedge Type Concrete Insert: Galvanized box-type ferrous castings, designed to accept ¾ inch diameter bolts having special wedge shaped heads.

2.3 FASTENERS

A. Nuts, Washers, Lags and Screws: Medium carbon steel; size and type to suit application; galvanized for high humidity locations, and treated wood; plain finish for other interior locations. Except where shown otherwise on the drawings, furnish type, size, and grade required for proper installation of work.

2.4 SHOP PAINTING AND PLATING

A. Hangers, supports, rods, inserts and accessories used for pipe supports, unless chromium plated, cadmium plated or galvanized shall be shop coated with metal primer paint.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not hang or support one pipe from another or from ductwork.

1. Do not bend threaded rod.

B. Support all insulated horizontal piping conveying fluids below ambient temperature, by any means of hangers or supports with insulation shields installed outside of the insulation.

C. Space hangers or supports for horizontal piping on maximum center distances as listed in the following hanger schedules, except as otherwise specified, or noted on the drawings.

1. For Steel Pipe:

PIPE SIZE (Inches)	MAXIMUM SPACING (Feet)
1 and under	8
1-1/4 and 1-1/2	9
2	10
2-1/2 and up	12

2. For Grooved End Steel Pipe:

PIPE SIZE (Inches)	MAXIMUM SPACING (Feet)
1-1/2 and under	7
2 through 4	10
5 and over	12

No pipe length shall be left unsupported between any two coupling joints.

3. For Directional Changes: Install a hanger or support close to the point of change of direction of all pipe runs in either a horizontal or vertical plane.

4. For Concentrated Loads: Install additional hangers or supports, spaced as required and directed, at locations where concentrated loads such as in-line pumps, valves, fittings or accessories occur, to support the concentrated loads.

5. For Branch Piping Runs and Runouts Over 5 feet in Length: Install a minimum of one hanger, and additional hangers if required by the hanger spacing schedules.

6. Parallel Piping Runs: Where several pipe lines run parallel in the same plane and in close proximity to each other, trapeze hangers may be submitted for approval. Base hanger spacing for trapeze type hangers on the smallest size of pipe being supported. Design the entire hanger assembly based on a safety factor of five, for the ultimate strength of the material used.

D. Minimum Hanger Rod Size:

PIPE OR TUBING SIZE (Inches)	SINGLE ROD HANGER SIZE (Inches)		DOUBLE ROD HANGER SIZE (Inches)	
	PIPE	TUBING	PIPE	TUBING
1/2 to 2	3/8	1/4	3/8	1/4
2-1/2 and 3	1/2	3/8	3/8	1/4
4 and 5	5/8	1/2	1/2	3/8
6	3/4	1/2	5/8	1/2
8, 10 and 12	7/8	5/8	3/4	5/8

E. Vertical Piping:

1. Support vertical risers of piping systems, by any means of heavy duty hangers installed close to base of pipe risers, and by riser clamps with extension arms at intermediate floors,

with the distance between clamps not to exceed 25 feet under, unless otherwise specified. Support pipe risers in vertical shafts equivalent to the aforementioned. Install riser clamps above floor slabs, with the extension arms resting on floor slabs. Provide adequate clearances for risers that are subject to appreciable expansion and contraction, causes by operating temperature ranges.

2. Support Extension arms of riser clamps, secured to risers to be insulated for cold service, 4 inches above floor slabs, to allow room for insulating and vapor sealing around riser clamps.

F. General:

1. Secure upper hanger attachments to overhead structural steel, steel bar joists, or other suitable structural members.

2. Do not attach hangers to steel decks that are not to receive concrete fill. Do not attach hangers to precast concrete plank decks less than 2-3/4 inches thick.

3. Do not use flat bars or bent rods as upper hanger attachments.

G. Attachment to Steel Construction: Provide intermediate structural steel members where required by pipe support spacing. Select steel members for use as intermediate supports based on a minimum safety factor of five.

1. Do not use drive-on beam clamps

2. Do not support piping over 4 inches in size from steel bar joists. Secure upper hanger attachments to steel bar joists at panel points of joists.

3. Do not drill holes in main structural steel members.

4. Beam clamps, with tie rods as specified, may be used as upper hanger attachments for the support of piping, subject to clamp manufacturer's recommended limits.

H. Attachment to Existing Cast-In-Place Concrete:

1. For piping up to a maximum of 4 inches in size, secure hangers to overhead construction with self-drilling type expansion shields and machine bolts.

2. Secure hangers to wall or floor construction with single unit expansion shields or self-drilling type expansion shields and machine bolts.

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SECTION 21 13 00 - SPRINKLER PIPING

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Through Penetration Firestops: Section 07 84 13.

B. Sealants: Section 07 92 00.

1.2 REFERENCES

A. NFPA 13 - Standard for the Installation of Sprinkler Systems.

1.3 SUBMITTALS

A. Product Data:

1. Catalog sheets and specifications indicating manufacturer name, type, applicable reference standard, schedule, or class for specified pipe and fittings.

2. Material Schedule: Itemize pipe and fitting materials for each specified application in Pipe and Fittings Schedule in Part 3 of this Section. Where optional materials are specified indicate option selected.

PART 2 - PRODUCTS

2.1. Products shall be from one of the following manufacturers: Victaulic Co, Grinnell Corp, Viking Sprinkler, Reliable Sprinkler or Tyco Fire Protection where applicable equipment is provided by these manufacturers.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe for Threading: Standard weight, Schedule 40, black or galvanized; ASTM A 53 or ASTM A 135.

B. Steel Pipe for Roll Grooving: Standard weight, Schedule 40, black or galvanized; ASTM A 53, Grade B, Type F for sizes 3/4 inch to 1-1/2 inch, and Type E or S for sizes 2 inch to 24 inch, or ASTM A 135.

C. Cast Iron Fittings:

1. Drainage Pattern, Threaded: ASME B16.12.

2. Steam Pattern, Threaded: ASME B16.4.
   a. Standard Weight: Class 125.
   b. Extra Heavy Weight: Class 250.

3. Flanged Fittings and Threaded Flanges: ASME B16.1.
   a. Standard Weight: Class 125.
   b. Extra Heavy: Class 250.

D. Unions: Malleable iron, 250 lb class, brass to iron or brass to brass seats.

E. Couplings: Same material and pressure rating as adjoining pipe, conforming to standards for fittings in such pipe. Use taper tapped threaded type in screwed pipe systems operating in excess of 15 psig.

F. Nipples: Same material and strength as adjoining pipe, except nipples having a length of less than one inch between threads shall be extra heavy.

2.3 DUCTILE IRON PIPE AND FITTINGS

A. Water Pipe: Bitumin coated and cement-mortar lined; AWWA C151.

1. 3 and 4 Inch Sizes: Class 51.

2. 6 inch Size and Over: Class 50.

B. Fittings: Bitumin coated and cement-mortar lined; AWWA C110.

2.4 COUPLINGS AND FITTINGS FOR GROOVED END PIPE

A. Couplings: UL Listed and FM Approved for fire protection. Pressure rating of 365 psi.

B. Fittings: By same manufacturer as couplings, having pressure ratings equal to or greater than couplings. Comply with the following standards:

1. Steel: ASTM A 53 or A 106, Grade B.

2. Malleable Iron: ASTM A 47.

3. Ductile Iron: ASTM A 536.

2.5 BOLTED MECHANICAL BRANCH CONNECTION

A. Victaulic Co.'s 920 Mechanical T.

B. ANVIL Corp.'s MT-2.

C. Grinnell's Figure 730.

2.6 JOINING AND SEALANT MATERIALS

A. Thread Sealant:

1. LA-CO Industries' Slic-Tite Paste with Teflon.
2. Loctite Corp.'s No. 565 Thread Sealant.
3. Rectorseal Pipe Thread Sealant.
4. Thread sealants for potable water shall be NSF approved.
5. Contractor shall only install thread sealant which is approved for use by the pipe manufacturer and the fittings manufacturer for fire protection systems.

B. Joint Packing:

1. Oiled Oakum: Manufactured by Nupak of New Orleans, Inc., 931 Daniel St., Kenner, LA 70062, (504) 466-1484.
2. Jamestown Distributors, 17 Peckham Drive, Bristol, PI.
3. Ferguson, 12500 Jefferson Ave, Newport News, VA.

C. Gaskets For Use With Ductile Iron Water Pipe: Synthetic rubber rings (molded or tubular): Clow Corp.'s Belltite, Tyler Pipe Industries Inc.'s Ty-Seal, or U.S. Pipe and Foundry Co.'s Tyton.

D. Flange Gasket Material:

1. For Use With Cold Water: 1/16 inch thick rubber.

E. Gaskets For Use With Grooved End Pipe and Fittings: Type and materials as recommended and furnished by the fitting manufacturer, for the service of piping system in which installed.

F. Anti-Seize Lubricant: Bostik Inc.'s Never Seez, Dow Corning Corp.'s Molykote 1000, or LPS Nickel Anti-Seize. Contractor shall only install anti-seize lubricant which is approved for use by the pipe manufacturer and the fittings manufacturer for fire protection systems.

2.7 PACKING MATERIALS FOR BUILDING CONSTRUCTION PENETRATIONS

A. Oiled Oakum: Manufactured by Nupak of New Orleans, Inc., 931 Daniel St., Kenner, LA 70062, (504)466-1484; Jamestown Distributors, 17 Peckham Drive, Bristol, PI. or Ferguson, 12500 Jefferson Ave, Newport News, VA.

B. Mechanical Modular Seals: Thunderline Corp.'s Link Seal wall and floor seals designed for the service of piping system in which installed. or APS's Interlynx or MetraFlex's MetraSeal.

2.8 PIPE SLEEVES

A. Type A: Schedule 40 steel pipe.

B. Type B: No. 16 gage galvanized sheet steel.

C. Type D: No. 16 gage galvanized sheet steel with 16 gage sheet steel metal collar rigidly secured to sleeve. Size metal collars as required to span a minimum of one cell or corrugation, on all sides of the rough opening thru the metal deck.

2.9 FLOOR, WALL AND CEILING PLATES

A. Cast Brass: Solid type with polished chrome plated finish, and set screw.

1. Series Z89 by Zurn, 929 Riverside Drive, Grosvenordale, CT 06255, (800) 243-1830.
2. Model 127XXXX by Mcguire Mfg., Cheshire CT 06410, (203) 699-1801.
3. ARGCO Northeast, Saddle Brook, NJ, 07663, (201) 797-3200.

B. Stamped Steel: Split type, polished chrome plated finish, with set screw.

1. Figures 2 and 13 by Anvil International, Portsmouth, NH 03802, (603) 422-8000.
2. ARGCO Northeast, Saddle Brook, NJ, 07663, (201) 797-3200
3. Grinnell Corp.

C. Cast Iron or Malleable Iron: Solid type, galvanized finish, with set screw:

1. Model 395 by Anvil International, Portsmouth, NH 03802, (603) 422-8000.
2. Model 900-016XX by Landsdale International, Westville, NJ 08093, (800) 908-0523.
3. ARGCO Northeast, Saddle Brook, NJ, 07663, (201) 797-3200.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install piping at approximate locations indicated, and at maximum height. Coordinate installation with all other trades.

B. Install piping clear of door swings, and above sash heads.

C. Make allowances for expansion and contraction.

D. Allow for a minimum of one inch free air space around pipe or pipe covering, unless otherwise specified.

E. Install horizontal piping with a constant pitch, and without sags or humps.

F. Install vertical piping plumb.

G. Use fittings for offsets and direction changes.

H. Cut pipe and tubing ends square; ream before joining.

I. Threading: Use American Standard Taper Pipe Thread Dies.

3.2 FIRE SPRINKLER AND FIRE STANDPIPE PIPING SYSTEM

A. Install piping to be completely drainable.

3.3 PIPE JOINT MAKE-UP

A. Threaded Joint: Make up joint with a pipe thread compound applied in accordance with manufacturer's printed application instructions for the intended service.

B. Flanged Pipe Joint:

1. Install threaded companion flanges on steel pipe; flanges on galvanized pipe are not required to be galvanized.
2. Provide a gasket for each joint.
3. Coat bolt threads and nuts with anti-seize lubricant before making up joint.

C. Rubber Ring Push-on Joint: Clean hub, bevel spigot, and make up joint with lubricated gasket in conformance with the manufacturer's printed installation instructions.

D. Grooved Pipe Joint: Roll groove pipe ends, make up joint with grooved end fittings and couplings, in conformance with the manufacturer's printed installation instructions.

1. Cut grooved end piping is not acceptable.

E. Mechanical Joint: Make up joint in conformance with the manufacturer's printed installation instructions, with particular reference to tightening of bolts.

F. Dissimilar Pipe Joint:

1. Joining Bell and Spigot and Threaded Pipe: Install a half coupling on the pipe or tube end to form a spigot, and calk into the cast iron bell.
2. Joining Dissimilar Threaded Piping: Make up connection with a threaded coupling or with companion flanges.
3. Joining Dissimilar Non-Threaded Piping: Make up connection with adapters recommended by the manufacturers of the piping to be joined.
4. Joining Galvanized Steel Pipe and Copper Tubing: Make up connection with a dielectric connector.

3.4 PIPING PENETRATIONS

A. Sleeve Schedule: Unless otherwise shown, comply with the following schedule for the type of sleeve to be used where piping penetrates wall or floor construction:

CONSTRUCTION	SLEEVE TYPE

1.	Frame construction.	None Required
2.	Foundation walls.	A*
3.	Non-waterproof interior walls.	B*
4.	Non-waterproof interior floors on metal decks.	D*
5.	Non-waterproof interior floors not on metal decks.	B*
6.	Floors not on grade having a floor drain.	A
7.	Floors over mechanical equipment, steam service, machine, and boiler rooms.	A
8.	Floors finished or to be finished with latex composition or terrazzo, and on metal decks.	D*
9.	Floors finished or to be finished with latex composition or terrazzo, and not on metal decks.	A
10.	Earth supported concrete floors.	None Required
11.	Exterior concrete slabs on grade.	A
12.	Fixtures with floor outlet waste piping.	None Required
13.	Metal roof decks.	C
14.	Non-metal roof decks.	A

*Core drilling is permissible in lieu of sleeves where marked with asterisks.

B. Diameter of Sleeves and Core Drilled Holes:

1. Unless otherwise specified, size holes thru floors and walls in accordance with the through penetration fire stopping system being used.

2. Size holes thru exterior walls or waterproofed walls above inside earth or finished floors, and exterior concrete slabs in accordance with the following:
   a. Uninsulated (Bare) Pipe: Inside diameter of sleeve or core drilled hole 1/2 inch greater than outside diameter of pipe, unless otherwise specified.
   b. Insulated Pipe: Inside diameter of sleeve or core drilled hole 1/2 inch greater than outside diameter of insulation, unless otherwise specified.

c. Mechanical Modular Seals: Size holes in accordance with the manufacturer's recommendations.

3. Size holes for sprinkler and fire standpipe piping in accordance with NFPA 13.

C. Length of Sleeves (except as shown otherwise on Drawings):

1. Walls and Partitions: Equal in length to total finished thickness of wall or partition.

2. Floors, Finished: Equal in length to total finished thickness of floor and extending 1/2 inch above the finished floor level, except as follows:

a. In furred spaces at exterior walls, extend sleeve one inch above the finished floor level.

3. Exterior Concrete Slabs: Equal in length to total thickness of slab and extending 1/2 inch above the concrete slab.

4. Roofs: Equal in length to the total thickness of roof construction, including insulation and roofing materials, and extending one inch above the finished roof level.

D. Packing of Sleeves and Core Drilled Holes:

1. Unless otherwise specified, pack sleeves or cored drilled holes in accordance with Section 078400 - FIRESTOPPING.

2. Pack sleeves in exterior walls or waterproofed walls above inside earth or finished floors with oakum to within 1/2 inch of each wall face, and finish both sides with Type 1C (one part) sealant. See Section 079200.
   a. Mechanical modular seals may be used in lieu of packing and sealant for sleeves and core drilled holes.

3. Pack sleeves in exterior concrete slabs with oakum to full depth, and within 1/2 inch of top of sleeve and finish the remainder with sealant. See Section 079200.
   a. Sealant Types:
   1) Piping Conveying Materials up to 140 degrees F other than Motor Fuel Dispensing System Piping: Type 1C (one part).
   b. Mechanical modular seals may be used in lieu of packing and sealant for sleeves and core drilled holes.

3.5 FLOOR, WALL AND CEILING PLATES

A. Install plates for exposed uninsulated piping passing thru floors, walls, ceilings, and exterior concrete slabs as follows:

1. Piping 2 Inch Size and Smaller In Finished Spaces:
   a. Solid Type: Chrome plated cast brass construction with set screw.
   b. Split Type: Chrome plated stamped steel construction with set screw.

2. Piping over 2 inch size In Finished Spaces, and Piping in Unfinished Spaces:
   a. Solid Type: Galvanized cast iron construction with set screw.
   b. Split Type: Chrome plated stamped steel construction with set screw.

3. Piping in Unfinished Spaces (Including Exterior Concrete Slabs): Solid type, galvanized, cast iron or malleable iron construction.

4. Fasten plates with set screws.

5. Plates are not required in pipe shafts or furred spaces.

3.6 PIPE AND FITTING SCHEDULE

A. Where options are given, choose only one option for each piping service. No deviations from the selected option will be allowed.

B. Fire Sprinkler:

1. Option No. 1: Standard schedule 40 weight black steel pipe, with extra heavy cast iron fittings, and threaded joints.

2. Option No. 2: Standard schedule 40 weight black steel pipe, with grooved ends, grooved pipe fittings, and couplings.

D. Sprinkler and Standpipe (Below Ground): Coated ductile iron water pipe and fittings, with mechanical or push-on joints.

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SECTION 21 13 13 - SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 RELATED WORK SPECIFIED ELSEWHERE

A. Backflow Preventers: Section 21 05 24.

B. Hangers and Supports: Section 21 05 29.

C. Sprinkler Piping: Section 21 13 00.

D. Wiring for Motors and motor Controllers Section 26 05 23.

E. Motors and Motor Controllers: Section 26 02 21

1.2 REFERENCE

A. NFPA 13 - National Fire Protection Association Standard for the Installation of Sprinkler Systems.

1.3 SYSTEM DESCRIPTION

A. Type of System:
   1. Wet System - Hydraulically Designed System.

B. Occupancy Classification:
   1. Light Hazard Occupancy.
   2. Ordinary Hazard Occupancy.

1.4 SUBMITTALS

A. Fire Protection Engineer Qualification:
   1. Where required by this specification or the project drawings to provide the services of a professional engineer, the professional engineer shall be a licensed Fire Protection Engineer, who is actively licensed in the State of New York.
   2. A licensed Fire Protection Engineer shall be defined as a registered professional engineer (P.E.) who has passed the fire protection engineering written examination administered by the National Council of Examiners for Engineering and Surveys (NCEES) or who has obtained a B.S or M.S. Degree in “Fire Protection Engineering” from an accredited engineering program at a recognized University or Institute.

B. Product data for each type of product: catalog sheets, specifications, and installation instruction indicating UL or FM approved for each product.
   1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Shop Drawings: For systems. As per NFPA 13 Plans and Calculations.
   1. Include plans, elevations, sections, and attachment details.
   2. Include diagrams for power, signal, and control wiring.

3. Hydraulic Calculations, computer and cross reference to appropriate drawings

D. The shop drawings shall be developed by and the hydraulic calculations shall be performed by person(s) meeting one of the following minimum qualification levels (without substitution):
   1. National Institute for Certification in Engineering Technologies (NICET) Level III or IV for Water-Based Fire Protection Systems certified technicians, OR
   2. A licensed Professional Fire Protection Engineer, licensed in the State of New York, and as defined by this specification.

E. Where a certified NICET Level III or IV Technician in "Water-Based Fire Protection System Layout" performs the shop drawings and hydraulic calculations, the drawings and hydraulic calculations shall bear the seal and signature of the NICET Technician.

F. Where a licensed Professional Fire Protection Engineer performs the shop drawings and hydraulic calculations, the drawings and hydraulic calculations shall bear the seal and signature of the licensed Professional Fire Protection Engineer.

G. Quality Control Submittals:

   1. Design Data: The all portions of the sprinkler system shall be sized in accordance with NFPA requirements for Hydraulically Designed Systems. Submit drawings and hydraulic calculations for approval.

   2. Certificates: As required under Quality Assurance Article.

   3. Company Field Advisor Data: Include:
      a. Name, business address and telephone number of Company Field Advisor secured for the required services.
      b. Certified statement from the Company listing the qualifications of the Company Field Advisor.
      c. Services and each product for which authorization is given by the Company, listed specifically for this project.
      d. Copy of:
         1) NICET Letter of Approval of advisor indicating Level III or IV for Water-Based Fire Protection Systems certification OR
         2) Licensure certificate for Professional Engineering in the State of New York, AND National Council of Examiners for Engineering and Surveying (NCEES) record/certificate for verification of completion of the Principles of Practice of Fire Protection Engineering Exam or copy of certified B.S. or M.S. degree from an accredited Fire Protection Engineering program.
      e. Contractor's Qualifications Data:
         1) Contractor's name, business address and telephone number.
         2) Names and addresses of 3 similar projects that each person has worked on during the past 5 years.
         3) Name of Project Manager for the project that is National Institute for Certification in Engineering Technologies (NICET) certified as Level III or IV for Water-Based Fire Protection Systems, or is a registered Professional Fire Protection Engineer in the State of New York. Provide a copy of Project Manager's:
            a) NICET Letter of Approval indicating Level III or IV for Water-Based Fire Protection Systems certification, OR
            b) Licensure certificate for Professional Engineering in the State of New York, AND National Council of Examiners for Engineering and Surveying (NCEES) record/certificate for verification of completion of the Principles of

Practice of Fire Protection Engineering Exam or copy of certified B.S. or M.S. degree from an accredited Fire Protection Engineering program.

4) Installer's Qualifications Data:
   a) Name of each person who will be performing the Work and their employer's name, business address and telephone number.
   b) Names and addresses of 3 similar projects that each person has worked on during the past 5 years.
5) Working Drawing/Hydraulic Calculation Preparer Qualification Data. Working drawings and hydraulic calculations shall be prepared by either a:
   a) National Institute for Certification in Engineering Technologies (NICET) certified as Level III or IV for Water-Based Fire Protection Systems technician.
   b) A licensed Professional Fire Protection Engineer, licensed in the State of New York, and as defined by this specification.
6) For the Working Drawing/Hydraulic Calculation Preparer qualification data, provide a copy of
   a) NICET Letter of Approval of supervisor indicating Level III or IV for Water-Based Fire Protection Systems certification OR
   b) Licensure certificate for Professional Engineering in the State of New York, AND National Council of Examiners for Engineering and Surveying (NCEES) record/certificate for verification of completion of the Principles of Practice of Fire Protection Engineering Exam or copy of certified B.S. or M.S. degree from an accredited Fire Protection Engineering program.

H. Certifications:

1. Welding certificates.

2. Certified NICET Level III or IV Technician for "Water-Based Fire Protection Layout".

3. NYS registered Professional Fire Protection Engineer. (minimum 5 years of experience having the ability to assess and design water-based fire protection systems).

I. Fire-hydrant flow test report. As per NFPA 13, test shall be conducted no more than 12 months prior to the working plan submittal.

J. Field Test Reports: Test Certificates and Test Forms to be used for projects. Each report chosen to which is applicable for each project specific.
   1. NFPA 13 Contractor's Material and Test Certificate for Aboveground Piping.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Sprinkler systems, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Domestic water piping and mechanical.

2. HVAC Ductwork and units.

3. Electrical conduit and Breaker panels.

4. Structural elements.

5. Items penetrating finished ceiling include the following:
   a. Lighting fixtures.
   b. Air outlets and inlets.
   c. Smoke Detectors.
   d. Exit signs.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For wet-pipe sprinkler systems and specialties to include in emergency, operation, maintenance manuals, parts list for mechanical and electric devices, and Publication NFPA 25 Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems. Submit one (1) set of copies to the Owner's Representative and a second set of copies to be inserted into the As-Built Drawing Cabinet located in the Fire Sprinkler Riser Room.

B. Warranty Information: Providing one-year parts and labor warranty certificate. Submit one copy to the Owner's Representative and provide a second copy to be inserted into the As-Built Drawing Cabinet located in the Fire Sprinkler Riser Room.

C. As-Built Drawings and Hydraulic Calculations: After final acceptance of the system all drawings and calculations shall have the NICET level III or IV Technician stamp, or a seal and signature by a NYS Registered Professional Fire Protection Engineer. Submit five (5) sets of copies to the Owner's Representative as a hard copy, and electronically as .pdf and .dwg. files. Then provide a second set of hard copies to be inserted into the As-Built Drawing Cabinet located in the Fire Sprinkler Riser Room.

D. As per the 2025 New York State Fire Code, follow requirements in 901.2.1 Statement of compliance. Before requesting final approval of the installation, the installing contractor shall furnish a written statement to the fire code official that the subject fire protection system has been installed in accordance with approved plans and has been tested in accordance with the manufacture's specifications and the appropriate installation standard. Any deviation from the design standards shall be noted and copies of the approvals for such deviations shall be attached to the written statement. Submit pdf copy to the Owner's Representative and provide a second hard copy and pdf to be inserted into the As-Built Drawing Cabinet located in the Fire Sprinkler Riser Room.

E. Field Test Reports: Completed NFPA Test Certificates and Test Forms signed by Installing Contractor and witnessed by Owner's Representative including their signature. Submit all related test reports in pdf to the Owner's Representative and provide the same related test reports in hard copy and pdf to be inserted into the As- Built Drawing Cabinet located in the Fire Sprinkler Riser Room.

   1. Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping", NFPA 24 "Contractor's Material and Test Certificate for Underground Piping", and NYSDOH Form 1013-Report on Test and Maintenance of Backflow Prevention Device, as applicable.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Sprinkler Cabinets: Finished, wall-mounted, steel cabinet with hinged cover. The stock of spare sprinklers shall include all types and ratings installed. Under 300 sprinklers-no fewer than six sprinklers, having 300 to 1000 sprinklers no fewer than 12 sprinklers, and having over 1000 sprinklers-no fewer than 24 sprinklers. A list of the sprinklers installed in the property shall be posted in the sprinkler cabinet. Include the list, listed as follows per NFPA 13, Chapter 6.

2. One sprinkler wrench as specified by the sprinkler manufacturer shall be provided in the cabinet for each type of sprinkler installed to be used for the removal and installation of the sprinklers in the system.

B. An As-Built Drawing Cabinet shall be installed at each project that has a new Fire Sprinkler System, alteration and fit-up which shall be located in the Fire Sprinkler Riser Room. All close out submittals for the project record documents shall be stored in the As-Built Drawing Cabinet.

1. As-Built Drawing Cabinet:
   a. Rigid 16 gage steel construction/ Red powder coat finish.
   b. Dimensions: 26.35”H x 14.25” W x 4” H.
   c. Full-length, stainless steel piano hinge w/Boston lock
   d. Surface mount w/ wall mount holes.

C. Laminated 11x17 paper: Emergency and Working Procedures and System Riser Diagram: Fasten to wall located in the Fire Sprinkler Riser Room.
   a. Start-up procedures.
   b. Shut-down procedures.
   c. Riser diagram showing valve locations and equipment with brass identification tags.
   d. Alarm Co. & Monitoring Co. contact information.
   e. Installing Contractors information.

D. Laminated 11x17 Building Map: Fasten to wall located in Fire Sprinkler Room.
   a. Showing Riser Detail Location: Include Main Control Valves, Main Drains, Low Point Drains, Inspectors Test Stations, Fire Alarm Control Panel, and Annunciator Panel.
   b. Each System numbered and color coded in what areas they cover of the building.

1.8 QUALITY ASSURANCE

A. Company Field Advisor with qualifications identified above. Secure the services of a Company Field Advisor for the following:

1. Observe installation of fire protection systems on a regular basis (minimum of once per month) throughout the duration of construction. Maintain a log/report of items noted, progress completed and adjustments made during each site observation. Maintain this log/report so that it can be furnished to the Owner’s representative and/or the Engineer at any time throughout construction.

2. Render advice regarding installation and final adjustment of the system.

3. Witness final system test and then certify with an affidavit that the system is installed in accordance with the contract documents and is operating properly.

4. Train facility personnel in operation, and routine maintenance of the system.

5. The Company Field Advisor shall be:
   a. National Institute for Certification in Engineering Technologies (NICET) Level III or IV for Water-Based Fire Protection Systems certified technicians, OR
   b. A licensed Professional Engineer, licensed in the State of New York, who has licensed by exam (Principles of Practice of Fire Protection Engineering Exam).

B. Contractor Qualifications: The Contractor performing the Work of this Section shall be experienced in sprinkler Work and shall have been regularly engaged in the installation of sprinkler systems for a minimum of 10 years and shall, upon request, furnish to the Owner's Representative the names and addresses of 5 similar projects which the Contractor worked on during the last 5 years.

1. The Project Manager employed to supervise the Work shall be National Institute for Certification in Engineering Technologies (NICET) certified as Level III or IV for Water-Based Fire Protection Systems, OR shall be a Professional Engineer licensed in the State of New York who has licensed by exam (Principles of Practice of Fire Protection Engineering Exam). The services of a Project Manager shall include but not limited to the following:
   a. Attendance at meetings during construction.
   b. Render advice regarding installation and final adjustment of the system.
   c. Witness final system test and then certify with an affidavit that the system is installed in accordance with the contract documents and is operating properly.
   d. Performance of hydraulic calculations and development of Working Drawings.
   e. Direct development of all submittals and requests for information (RFIs). Delegated design or delegated duties shall not be permitted. An affidavit shall be provided with each submittal and RFI stating that the qualified project manager directly developed the document being submitted.
   f. Visit the site at a minimum on a monthly basis during active installation of the fire protection systems. During each site observation, the Project Manager shall document the progress of the sprinkler system installation, and shall document all items which have been modified/adjusted in the field for NFPA-13 compliance.
   g. The Project Manager is permitted to be the same personnel as the Company Field Advisor, and shall perform all the duties as the Company Field Advisor and the Project Manager if one person is serving both roles.

C. Installer Qualifications: The workers and supervisors performing the Work of this Section shall be personally experienced in sprinkler systems work and shall have been regularly employed by a company engaging in the installation of sprinkler systems for a minimum of 5 years and shall, upon request, furnish to the Owner's Representative the names and addresses of 3 similar projects which they have worked on during the last 5 years.

D. Working Drawing/Hydraulic Calculation Preparer Qualifications:

1. The persons employed to prepare these documents for the Work shall be personally experienced in sprinkler work and shall have been regularly performing such work for a minimum of 5 years while in the employ of a company or companies engaged in the installation of fire protection systems.
   a. Upon request, furnish to the Owner's Representative the names and addresses of five similar projects which the foregoing people have prepared working drawings/hydraulic calculations on during the past 3 years.

b. The persons employed to prepare these documents for the Work shall be performed by person(s) meeting one of the following minimum qualification levels (without substitution):

1) National Institute for Certification in Engineering Technologies (NICET) Level III or IV for Water-Based Fire Protection Systems certified technicians, OR

2) A licensed Professional Fire Protection Engineer, licensed in the State of New York, and as defined by this specification.

E. System Acceptance:

1. Comply with NFPA 13 requirements.

2. Complete and sign the Contractor's Material and Test Certifications and provide copies to Owner's Representative.

3. Tests shall be witnessed by the Owner's Representative.

F. Regulatory Requirements:

1. Materials for the Work of this Section shall be Underwriter's Laboratories listed, and/or Factory Mutual approved.

G. Certification: NFPA Contractor's Material and Test Certificate.

H. Welding Qualifications: Qualify procedures and operators according to 2010 ASME Boiler and Pressure Vessel Code.

1.9 FIELD CONDITIONS

A. Interruption of Existing Fire Protection Service: Do not interrupt fire protection service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary sprinkler service according to requirements indicated:

1. Follow the Impairment Procedures as per NFPA 25 & NFPA 13/14 standards.

2. Notify Owner's Representative no fewer than five (5) working days in advance of proposed interruption of sprinkler service as per the 2025 New York State Fire Code follow requirements in 901.7 Systems out of service. Approved fire watch shall be provided for all occupants left unprotected by the shutdown until the fire protection system has been returned to service.

3. Before shutting down the fire protection system to perform the work, notify the Owner's Representative in writing that the system is to be shut down temporarily. Give schedule which states date and time of proposed shut down and approximate length of time that the system will be out of service. Request instructions for precautions that should be taken during the shutdown period.

4. Do not shut down system until schedule is approved by the Owner's Representative.

5. Return the existing system to pre-shutdown operation immediately after Work has been completed. Give written notice to the Owner's Representative that the system has been returned to pre-shutdown operation.

PART 2 - PRODUCTS

2.1 VALVES AND ACCESSORIES

A. Gate Valves (175 psig non-shock working pressure):

1. 3/4 inch to 2 inch: Bronze body, OS & Y indicating type; double or wedge disc with threaded ends.

2. 2-1/2 inch and larger: IBBM, OS & Y indicating type; double or wedge disc with end connections as required to suit the piping system.

3. Nibco, Morrison, or Kennedy.

B. Butterfly Valves: UL/FM approved, 300 psi grooved ends, polyphenylene sulfide coated ductile iron body (ASTM A-536). Ductile iron disc, synthetic rubber encapsulated suited for intended service, with integrally cast stem. Complete with waterproof actuator and pre-wired supervisory switches. Victaulic Series 705 W Fire Lock, Tyco BFV-300, or Globe GLR300G.

C. Inspector's Test Outlet Valve: Ball type, bronze body, Type 316 stainless steel ball and stem, teflon seats and stem packing, 400 psi WOG. Valve shall have padlocking feature in both the open and closed position.

1. Nibco, Watts, or AGF.

D. Valve Locking Devices:

1. Chain: 3/16 inch galvanized steel, welded link.

2. Padlock: Key all locks alike. Furnish 2 keys for each lock.

3. Key Tags: 1-1/2 inch dia., brass, stamped with valve number and service.

4. "S" Hooks: Brass, for securing keys to key tags.
5. Brady, Masterlock, or Emedco.

E. Alarm Check Valve:

1. Two piece cast iron body, bolted and gasketed.

2. Moving parts brass, bronze, or stainless steel with replaceable rubber clapper facing.

3. Right or left hand trimming as required.

4. Suitable for horizontal or vertical installation.

5. Two pressure gages.

6. Main drain tap.

7. Alarm retarding chamber for water motor alarm device and electric alarm pressure switch.
   a. Pressure switch: Equip with spst or spdt contacts rated 10 Amps at 110 V ac, adjustable differential, range as required; NEMA Type 12 enclosure.

8. Factory finish with corrosion resistant red paint.

9. Trim Package: Angle valve, globe valve, alarm line strainer, orifice restriction, pipe nipples and fittings.

10. Viking, Reliable, or Victaulic.

F. Check Valves: IBBM, single clapper swing check with metal to metal or rubber faced checks, suitable for horizontal and vertical installation; end connections as required to suit the piping system; 175 psig non-shock working pressure.

1. Ball Drip (where shown on Drawings): Brass, automatic; threaded on both ends.

2. Viking, Nibco, or Milwaukee.

H. Pressure Gages: Range of 2 times system working pressure at point where installed. Equip with gage cock and provisions for draining.

1. Watts, Wika, or Lansdale.

I. Inspector's Test Connection: Cast brass, capped, sprinkler line tester fitting; Elkhart Brass Mfg. Co.'s. No. 112, or Seco Mfg., Inc.'s No. 445 or 446.

1. Viking, Reliable, or AGF.

J. Zone Control Riser Module: Install in zoned wet sprinkler systems, a compact design zone control riser module consisting of a ductile iron module body with grooved ends, shutoff valve, test and drain valve combination with different orifice sizes, and vane type waterflow detector with sealed retard, visual switch activation, and mechanical delay adjustment. FM approved for working pressures up to 365 psi and UL Listed for working pressures up to 300 psi. Installed with a pressure relief valve kit up to 175 psi. Victaulic UMC, Tyco RM-1, or Reliable CR.

2.2 SPRINKLER HEADS AND APPURTENANCES

A. Sprinkler Heads: Brass or bronze, with standard orifice, and deflector:

1. Upright or Pendent Type: Deflector designed to distribute water downward in a uniform hemispherical spray pattern.

2. Concealed Pendent type: Deflector designed to distribute water downward in a uniform hemispherical spray pattern. Deflector is concealed by a flat or domed cover bonded to the escutcheon with thermal solder.

3. Sidewall Type: Deflector designed to distribute water downward away from the wall or beam on which the sprinkler is installed in a uniform semi-hemispherical spray pattern.

3. Refer to manufacturer's installation guidelines for Quick Response Sprinkler's

4. Markings: Stamp sprinkler type on deflector in addition to NFPA's color code requirements covering temperature classification.

5. Finish: Contractor shall refer to architectural drawings for ceiling colors and coordinate with the architect.

B. Escutcheons:

1. Material: To match sprinklers

2. Finish: To match sprinklers

C. Spare Sprinkler Head Cabinet: Steel, with hinged cover, constructed of minimum 20 gage material and fitted with 16 gage steel racks designed to hold quantities and types of spare sprinkler heads and sprinkler head wrenches.

1. Finish: Bright red, baked on enamel.

D. Sprinkler Head Guards:

1. Type: Formed Wire Cage

2. Finish: Red Enamel

3. Head guards shall be listed for the sprinklers on which they are installed.

2.3 WATER FLOW ALARM DEVICE

A. Vane Type Waterflow Switch: Autocall Div., Federal Signal Corp.'s 4160, Potter Electric Signal Co.'s VSR-F, or Reliable's Model A., having:

1. Corrosion-resistant vane.

2. Splash/dust resistant enclosure with anti-tamper switch.

3. Adjustable pneumatic retard.

4. Screw type wiring terminals.

5. Switch rated minimum 7.0 amps at 125 V ac and 0.25 amps at 125 V dc.

B. Pressure Type Waterflow Switch

1. UL, CUL Listed / FM, LPCB Approved and CE Marked pressure type waterflow switches shall be furnished and installed on the alarm port of each dry pipe valve, on top of or down stream of each retard chamber on each alarm check valve, on the alarm port of each alarm check valve of each excess pressure system, the alarm port of each preaction system and where indicated on the drawings and plans and as required by applicable local and national codes and standards.

2. Pressure type waterflow switches shall be diaphragm type devices consisting of a non-corrosive ½" NPT male nipple for connection to the sprinkler system, dual non-corrosive pressure chambers and diaphragms, independently adjustable pressure settings, two conduit entrances and two Single Pole Double Throw (SPDT) switches separated by a barrier providing separate wiring chambers for each switch to comply with the NEC requirements for separation of power limited and non power limited conductors without the need for special wire or wire methods. The device shall be NEMA 4 rated and the enclosure shall be held captive by a tamper resistant screw. It shall be possible to install an optional cover tamper switch to detect removal of the enclosure.

3. The switch shall be factory set to operate at 4-8 psi. The device shall be listed for pressures up to 300 psi. The adjustable range shall be 4-15 psi and it shall be possible to change the

factory set operating point of the pressure switch without the use of any tools. It shall be possible to change the pressure setting of either switch without affecting the pressure setting of the other switch. The switch contacts shall be rated at 10.1A, 125VAC and 2A, 30VDC.

4. All in-line valves that can shut off the flow of water to the alarm pressure switch shall be electrically supervised in the full open position.

5. Potter PS10-2, Reliable EPS, or Tyco PS10.

2.5 VALVE SUPERVISORY SWITCHES

A. Mechanically actuated, designed to close contacts and sound an alarm when supervised valve is closed and when switch cover removed.

1. For Gate Valves: Potter Electric Signal Co.'s OSYSU-A, or Grinnell's F640 or System Sensor.

2. For Post Indicator Valves: Potter Electric Signal Co.'s PIVSU-A2, or Potter-Roemer, Inc.'s 6223 or System Sensor.

2.6 SIGNS

A. Steel with vitreous enamel finish, lettering on contrasting background to identify and indicate the function of:

1. Control valves.

2. Drain, test, air supply and alarm check valves.

3. Water motor alarm.

4. Hydraulic Design Nameplate Data: Size approx. 9 x 12 inches, inscribed with the following:
   a. SPRINKLER SYSTEM HYDRAULICALLY DESIGNED (in block letters).
   b. Location and area of hydraulically designed section.
   c. Discharge density over designed area in gallons per minute.
   d. Residual pressure at base of riser supplying water to designed section.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Unless otherwise shown or specified, install the Work of this section in accordance with NFPA 13, and the item manufacturer's installation instructions.

B. Locking Valves:

1. Lock gate valves in open position with chain looped through handwheel and around adjacent sprinkler pipe. Secure with padlock.

2. Lock test outlet valve in closed position with padlock.

C. Spare Sprinkler Head Cabinet: Secure to building wall or other permanent structure in vicinity of main valve controlling sprinkler system, unless otherwise directed.

D. Connection to Existing Main: A bolted mechanical branch connection may be used. Refer to Section 211300.

E. Signs: Install signs identifying the following:

1. Valves: One for each size, type and function.

2. Water Motor Alarm.

3. Hydraulically Designed System.

3.2 FIELD QUALITY CONTROL

A. Tests: Unless otherwise shown or specified, perform tests in accordance with NFPA 13.

1. Flushing: In addition to the requirements of the Standard, flush new piping before making final connection to existing systems and before performing hydrostatic test. Flush at rates of flow prescribed in the Contractor's Material and Test Certificate. After making final connections, flush entire system and assure that debris is removed from piping and there are no stoppages or obstructions in the system.

2. System Tests:
   a. Test all new Work.
   b. Notify the General Contractor when the Work of this Section is ready for testing.
   c. Perform the tests when directed, and in the contractor's presence.

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SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Motors.
2. Packless expansion joints.
3. Alignment guides and anchors.
4. Sleeves without waterstop.
5. Sleeves with waterstop.
6. Sleeve-seal systems.
7. Grout.
8. Silicone sealants.
9. Escutcheons.
10. Thermometers, liquid in glass, lead free.
11. Thermowells, lead free.
12. Pressure gauges, dial type, lead free.
13. Gauge attachments, lead free.

B. Related Requirements:

1. Section 221119 "Domestic Water Piping Specialties" for water meters.

1.2 ACTION SUBMITTALS

A. Product data.

B. Delegated Design Submittals: For each anchor and alignment guide, including analysis data, signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
3. Alignment Guide Details: Detail field assembly and attachment to building structure.
4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators in accordance with 2021 ASME Boiler and Pressure Vessel Code, Section IX.

1.6 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Domestic water expansion fittings and loops for plumbing piping intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act, with requirements of authorities having jurisdiction, and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. Compatibility: Provide products suitable for piping service fluids, materials, working pressures, and temperatures.

C. Capability: Provide products and installations to accommodate maximum axial movement as scheduled or indicated on Drawings.

2.2 MOTORS

A. Motor Requirements, General:

1. Content includes motors for use on alternating-current power systems of up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.
2. Comply with requirements in this Section except when stricter requirements are specified in equipment schedules or Sections.
3. Comply with NEMA MG 1 unless otherwise indicated.

B. Motor Characteristics:

1. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 ft. above sea level.
2. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

C. Single-Phase Motors:

1. Motors larger than 1/20 hp must be one of the following, to suit starting torque and requirements of specific motor application:

   a. Permanent-split capacitor.
   b. Split phase.
   c. Capacitor start, inductor run.
   d. Capacitor start, capacitor run.

2. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
3. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
4. Motors 1/20 HP and Smaller: Shaded-pole type.
5. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device will automatically reset when motor temperature returns to normal range.

D. Electronically Commutated Motors:

1. Microprocessor-Based Electronic Control Module: Converts 120 V single-phase AC power to three-phase DC power to operate the brushless DC motor.

2.3 EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

A. Performance Requirements:

1. Compatibility: Provide products suitable for piping service fluids, materials, working pressures, and temperatures.
2. Capability: Provide products and installations that will accommodate maximum axial movement as scheduled or indicated on Drawings.

B. Packless Expansion Joints: Metraflex, Flex-Hose Co., or Flexicraft Industries.

1. Flexible-Hose Packless Expansion Joints, Lead Free:
   a. Source Limitations: Obtain flexible-hose packless expansion joints from single manufacturer.
   b. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
   c. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
   d. Expansion Joints for Copper Tubing NPS 2 (DN 50) and Smaller: Copper-alloy fittings with solder-joint end connections.
      1) Bronze hoses and double-braid bronze sheaths with 700 psig at 70 deg F and 500 psig at 450 deg F ratings.

   e. Expansion Joints for Copper Tubing NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Copper-alloy fittings with threaded end connections.
      1) Stainless steel hoses and double-braid, stainless steel sheaths with 420 psig at 70 deg F and 315 psig at 450 deg F ratings.

2. Source Limitations: Obtain grooved-joint expansion joints from single manufacturer.
3. Description: Factory-assembled expansion joint made of several grooved-end pipe nipples, couplings, and grooved joints.
4. Standard: AWWA C606, for grooved joints.
5. Material: ASTM A53/A53M, Schedule 40 stainless steel pipe with grooved ends.

C. Alignment Guides and Anchors: MetraFlex, Flexicraft Industries, or Anvil

1. Alignment Guides:
   a. Source Limitations: Obtain alignment guides from single manufacturer.
   b. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding slider for bolting to pipe. Provide dielectric spacer for use with copper tubing/piping.

2. Anchor Materials:

   a. Steel Shapes and Plates: ASTM A36/A36M.
   b. Bolts and Nuts: ASME B18.10 or ASTM A183, steel hex head.
   c. Washers: ASTM F844, steel, plain, flat washers.
   d. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.

      1) Stud: Threaded, stainless steel.

2) Expansion Plug: Stainless steel.
3) Washer and Nut: Stainless steel.

e. Chemical Fasteners: Insert-type stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.

1) Bonding Material: ASTM C881/C881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
2) Stud: ASTM A307, Stainless steel with continuous thread on stud unless otherwise indicated.
3) Washer and Nut: Stainless steel.

2.4 SLEEVES AND SLEEVE SEALS

A. Sleeves without Waterstop:

1. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron, with plain ends.
2. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, hot-dip galvanized, with plain ends.
3. Steel Sheet Sleeves: ASTM A653/A653M, 24 gauge minimum thickness; hot-dip galvanized, round tube closed with welded longitudinal joint.

B. Sleeves with Waterstop: Polywater PZVR, Hauff-Technik ZVR, or Garlock Link-Seal

1. Description: Manufactured PVC/HDPE, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall.

C. Sleeve-Seal Systems: Polywater PHRD, Roxtec, Galock

1. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

a. Hydrostatic Seal: 20 psig minimum.
b. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
c. Pressure Plates: Carbon steel.
d. Connecting Bolts and Nuts: Carbon steel, with zinc coating, ASTM B633 of length required to secure pressure plates to sealing elements.

D. Grout:

1. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.
2. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
3. Design Mix: 5000 psi, 28-day compressive strength.

4. Packaging: Premixed and factory packaged.

2.5 ESCUTCHEONS

A. Escutcheon Types:

1. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.
2. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.
3. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.
4. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed hinge; and spring-clip fasteners.

B. Floor Plates:

1. Split Floor Plates: Cast brass with concealed hinge.

2.6 METERS AND GAUGES FOR PLUMBING PIPING

A. Thermometers, Liquid in Glass, Lead Free - Metal Case, Industrial Style:

1. Source Limitations: Provide liquid-in-glass, lead-free, metal-case, industrial-style thermometers from single manufacturer.
2. Standard: ASME B40.200.
3. Case: Cast aluminum; 9-inch nominal size unless otherwise indicated.
4. Case Form: Adjustable angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue or red organic liquid, mercury free.
6. Tube Background: Nonreflective aluminum with permanent scale markings graduated in deg F.
7. Window: Glass.
8. Stem: Aluminum and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

9. Connector: 1-1/4 inches, with ASME B1.1 or ASME B1.20.1 screw threads to fit thermowell.
10. Accuracy: Plus or minus 1 percent of span or one scale division, to a maximum of 1.5 percent of span.

B. Thermowells, Lead Free:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: Lead-free copper.
4. Material for Use with Steel Piping: Type 304 stainless steel.
5. Type: Stepped shank unless straight or tapered shank is indicated.

6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, or as required to match threaded opening in pipe.
7. Internal Threads: Size and thread type as required to match thermometer mounting threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length to extend to center of pipe.
10. Lagging Extension: Include on thermowells for insulated piping and tubing. Extension is to be of sufficient length to extend beyond finished insulation surface.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.
12. Heat-Transfer Medium: Mixture of graphite and glycerin.

C. Pressure Gauges, Dial Type, Lead Free - Direct Mounted, Metal Case:

1. Source Limitations: Provide dial-type, lead-free, direct-mounted, metal-case pressure gauges from single manufacturer.
2. Standard: ASME B40.100.
3. Case: Liquid-filled; cast aluminum; 6-inch nominal diameter.
4. Pressure-Element Assembly: Lead-free Bourdon tube.
5. Pressure Connection: Lead-free brass, with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanent scale markings graduated in psi.
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Metal.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of span.

D. Gauge Attachments, Lead Free:

1. Snubbers: ASME B40.100, lead-free brass; with NPS 1/4 or NPS 1/2, ASME B1.20.1 pipe threads and porous-metal-type surge-dampening device. Include extension for use on insulated piping.
2. Valves: Lead-free brass ball, with NPS 1/4 or NPS 1/2 ASME B1.20.1 pipe threads.

PART 3 - EXECUTION

3.1 INSTALLATION OF EXPANSION JOINTS, GENERAL

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

3.2 INSTALLATION OF ALIGNMENT GUIDES AND ANCHORS

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install one guide on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.

C. Attach guides to pipe, and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:

1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9.
2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-58, Type 24; U bolts bolted to anchor.

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.

1. Anchor Attachment to Steel Structural Members: Attach by welding.
2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.
3. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

3.3 INSTALLATION OF PIPE LOOP AND SWING CONNECTIONS

A. Connect risers and branch connections to mains with at least five pipe fittings, including tee in main.

B. Connect risers and branch connections to terminal units with at least four pipe fittings, including tee in riser.

C. Connect mains and branch connections to terminal units with at least four pipe fittings, including tee in main.

3.4 INSTALLATION OF SLEEVES - GENERAL

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout, seal the space outside of sleeves in floors/slabs/walls without sleeve-seal system. Select to maintain fire resistance of floor/slab/wall.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants that joint sealant manufacturer's literature indicates is appropriate for size, depth, and location of joint.

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF SLEEVES WITH WATERSTOP

A. Install sleeve with waterstop as new walls and slabs are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange centered across width of concrete slab or wall.

C. Secure nailing flanges to wooden concrete forms.

D. Using grout, seal space around outside of sleeves. Select to maintain fire resistance of floor/slab/wall.

3.6 INSTALLATION OF SLEEVE-SEAL SYSTEMS

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building, and passing through exterior walls.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.7 INSTALLATION OF ESCUTCHEONS

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

3.8 INSTALLATION OF METERS AND GAUGES

A. Install thermometer with thermowell at each required thermometer location.

B. Install thermowells in vertical position in piping tees.

C. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

D. Install thermowells with extension on insulated piping.

E. Fill thermowells with heat-transfer medium.

F. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

G. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks.

H. Install direct-mounted pressure gauges in piping tees with pressure gauge located on pipe at most readable position.

I. Install remote-mounted pressure gauges on panel.

J. Install valve and snubber in piping for each pressure gauge for fluids.

K. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.
2. Inlets and outlets of each domestic water heat exchanger.
3. Inlet and outlet of each domestic hot-water storage tank.
4. Inlet and outlet of each remote domestic water chiller.
5. Outlet side of hot-water-balancing valve.
6. Each main hot-water-recirculating line return pipe.

L. Install pressure gauges in the following locations:

1. Building water service entrance into building.
2. Inlet and outlet of each pressure-reducing valve.
3. Suction and discharge of each domestic water pump.

3.9 CONNECTIONS

A. Install meters and gauges adjacent to machines and equipment to allow space for service and maintenance of meters, gauges, machines, and equipment.

3.10 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gauges to proper angle for best visibility.

3.11 FIELD QUALITY CONTROL

A. Sleeves and Sleeve Seals:

1. Perform the following tests and inspections:

a. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.
b. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

2. Prepare test and inspection reports.

B. Escutcheons:

1. Using new materials, replace broken and damaged escutcheons and floor plates.

3.12 SLEEVES APPLICATION

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above and below Grade:

a. Sleeves with waterstops.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

2. Concrete Slabs-on-Grade:

a. Sleeves with waterstops.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs above Grade:

a. Sleeves with waterstops.

4. Interior Wall and Partitions:

a. Sleeves without waterstops.

3.13 ESCUTCHEONS APPLICATION

A. Escutcheons for New Piping and Relocated Existing Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One piece, deep pattern.
2. Chrome-Plated Piping: One piece, steel with polished, chrome-plated finish.
3. Insulated Piping:

.

a. One piece, steel with polished, chrome-plated finish.

4. Bare Piping at Wall and Floor Penetrations in Finished Spaces:

a. One piece, steel with polished, chrome-plated finish.

5. Bare Piping at Ceiling Penetrations in Finished Spaces:

a. One piece, steel with polished, chrome-plated finish.

B. Install floor plates for piping penetrations of equipment-room floors.

C. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping and Relocated Existing Piping: One piece, floor plate.
2. Existing Piping: Split floor plate.

3.14 THERMOMETER, LEAD FREE, APPLICATION

A. Thermometers at inlet and outlet of each domestic water heater are to be the following:

1. Sealed, bimetallic-actuated type.
2. Direct-mounted, metal-case, vapor-actuated type.
3. Metal case, industrial-style, liquid-in-glass type.

B. Thermometer stems are to be of length to match thermowell insertion length.

3.15 THERMOMETER, LEAD FREE, SCALE-RANGE APPLICATION

A. Scale Range for Domestic Cold-Water Piping:

1. 0 to 100 deg F.

B. Scale Range for Domestic Hot-Water Piping:

1. 0 to 250 deg F.

3.16 PRESSURE-GAUGE APPLICATION

A. Pressure gauges at discharge of each water service into building are to be the following:

1. Liquid filled , direct mounted, metal case.
2. Test plug with EPDM self-sealing rubber inserts.

B. Pressure gauges at inlet and outlet of each water pressure-reducing valve are to be the following:

1. Liquid filled, direct mounted, metal case.
2. Test plug with EPDM self-sealing rubber inserts.

C. Pressure gauges at suction and discharge of each domestic water pump are to be the following:

1. Liquid filled, direct mounted, metal case.
2. Test plug with EPDM self-sealing rubber inserts.

3.17 PRESSURE-GAUGE SCALE-RANGE APPLICATION

A. Scale Range for Water Service Piping:

1. 0 to 200 psi.

B. Scale Range for Domestic Water Piping:

1. 0 to 200 psi.

END OF SECTION 220500

SECTION 220523 - GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ball valves.
2. Butterfly valves.
3. Check valves.

1.2 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene-diene terpolymer.

C. FKM: Fluoroelastomer.

D. NBR: Nitrile butadiene rubber (also known as Buna-N).

E. NRS: Nonrising stem.

F. OS&Y: Outside screw and yoke.

G. PTFE: Polytetrafluoroethylene.

H. RPTFE: Reinforced polytetrafluoroethylene.

I. RS: Rising stem.

1.3 ACTION SUBMITTALS

A. Product data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Standards:

1. Domestic-water piping valves intended to convey or dispense water for human consumption must comply with the U.S. Safe Drinking Water Act (SDWA), requirements of authorities having jurisdiction, and NSF 61/NSF 372; or to be certified in compliance with NSF 61/NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded-end valves.
2. ASME B16.1 for flanges on iron valves.
3. ASME B16.5 for flanges on steel valves.
4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
5. ASME B16.18 for cast-copper solder-joint connections.
6. ASME B16.22 for wrought-copper solder-joint connections.
7. ASME B16.34 for flanged- and threaded-end connections.
8. ASME B16.51 for press joint connections.
9. ASME B31.9 for building services piping valves.

C. AWWA Compliance: Comply with AWWA C606 for grooved-end connections.

D. Provide bronze valves made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are unacceptable.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Bypass and Drain Connections: MSS SP-45.

H. Valve Actuator Type:

1. Gear Actuator: For quarter-turn ball valves NPS 4 and larger.
2. Hand Lever: For quarter-turn ball valves smaller than NPS 4.

I. Valves in Insulated Piping:

1. Provide 2-inch extended neck stems.
2. Provide extended operating handles with nonthermal-conductive covering material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Provide memory stops that are fully adjustable after insulation is applied.

2.2 BALL VALVES, LEAD FREE: Legend, Watts, or Apollo valves

A. Ball Valves, Lead Free, Threaded or Soldered Ends - Brass, Two Piece with Full Port and Brass Trim:

1. Standards: MSS SP-110 and MSS SP-145.
2. CWP Rating: 600 psig.
3. Body Design: Two piece.
4. Body Material: Forged brass.
5. Ends: Threaded or soldered. See Part 3 ball valve schedule articles.
6. Seats: PTFE.
7. Stem: Brass.
8. Ball: Chrome-plated brass.
9. Port: Full.

2.3 BALL VALVES, GENERAL PURPOSE: Legend, Watts, or Apollo valves

A. Ball Valves, Threaded or Soldered Ends - Brass, Two Piece with Full Port and Brass Trim:

1. Standard: MSS SP-110.
2. SWP Rating: 150 psig.
3. CWP Rating: 600 psig.
4. Body Design: Two piece.
5. Body Material: Forged brass.
6. Ends: Threaded or soldered. See Part 3 ball valve schedule articles.
7. Seats: PTFE.
8. Stem: Brass.
9. Ball: Chrome-plated brass.
10. Port: Full.
11. Port: Full.

2.4 BUTTERFLY VALVES, LEAD FREE: Apollo, Nibco, or Milwaukee valves

A. Butterfly Valves, Lead Free, Single Flange (Lug Type) - Iron, with Aluminum-Bronze Disc:

1. Standard: MSS SP-67, Type I.
2. CWP Rating: 150 psig, or 200 psig. See Part 3 butterfly valve schedule articles.
3. Body Design: Single flange (lug type), suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
4. Body Material: ASTM A126, cast iron or ASTM A536, ductile iron.
5. Seat: EPDM or NBR. See Part 3 butterfly valve schedule articles.
6. Stem: One- or two-piece stainless steel.
7. Disc: Aluminum bronze.

2.5 CHECK VALVES, LEAD FREE: Apollo, Watts, or Milwaukee valves

A. Check Valves, Lead Free, Swing Type, Threaded or Soldered Ends - Bronze, with Bronze Disc, Class 125:

1. Standard: MSS SP-80, Type 3.
2. CWP Rating: 200 psig.
3. Body Design: Horizontal flow.
4. Body Material: ASTM B62, bronze.
5. Ends: Threaded or soldered. See Part 3 check valve schedule articles.
6. Disc: Bronze.

B. Check Valves, Lead Free, Swing Type, Threaded or Soldered Ends - Bronze, with Bronze Disc, Class 150:

1. Standard: MSS SP-80, Type 3.
2. CWP Rating: 300 psig.
3. Body Design: Horizontal flow.
4. Body Material: ASTM B62, bronze.
5. Ends: Threaded or soldered. See Part 3 check valve schedule articles.
6. Disc: Bronze.

PART 3 - EXECUTION

3.1 INSTALLATION OF VALVES

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Provide support of piping adjacent to valves such that no force is imposed upon valves.

C. Locate valves for easy access and where not blocked by equipment, other piping, or building components.

D. For valves in horizontal piping, install valves with stem at or above center of pipe.

E. Install valves in position that does not project into aisles or block access to other equipment.

F. Install valves in position to allow full stem and actuator or manual operator movement.

G. Verify that joints of each valve have been properly installed and sealed to assure there is no leakage or damage.

H. Install check valves for proper direction of flow and as follows:

1. Check Valves, Swing Type: In horizontal position with hinge pin level.

I. Valve Tags: Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

J. Adhere to manufacturer's written installation instructions. When soldering or brazing valves, do not heat valves above maximum permitted temperature. Do not use solder with melting point temperature above valve manufacturer's written recommended maximum.

3.2 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option or press-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.

3.3 DOMESTIC HOT- AND COLD-WATER BALL VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Ball valves, lead free, threaded or soldered ends - brass, two piece with full port and brass trim; threaded or soldered ends.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Ball valves, lead free, flanged or threaded ends - iron, Class 125; flanged or threaded ends.

3.4 DOMESTIC HOT- AND COLD-WATER BUTTERFLY VALVE SCHEDULE

A. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Butterfly valves, lead free, single flange (lug type) - iron, with aluminum-bronze disc; 200 CWP, EPDM seat.

3.5 DOMESTIC HOT- AND COLD-WATER CHECK VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Check valves, lead free, swing type, threaded or soldered ends - bronze, with bronze disc, Class 125; threaded or soldered ends.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Check valves, lead free, swing type, flanged or threaded ends - iron, with metal seats, Class 125; flanged or threaded ends.

END OF SECTION 220523

SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal hanger-shield inserts.
4. Fastener systems.
5. Pipe-positioning systems.
6. Equipment supports.

B. Related Requirements:

1. Section 220500 "Common Work Results for Plumbing."
2. Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment" for vibration isolation devices.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.4 QUALITY ASSURANCE

A. Structural-Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M.

B. Pipe Welding Qualifications: Qualify procedures and operators according to "2015 ASME Boiler and Pressure Vessel Code, Section IX."

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized, hot-dip galvanized, or electro-galvanized.
3. Nonmetallic Coatings: Plastic coated or epoxy powder coated.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Copper Pipe and Tube Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 THERMAL HANGER-SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C552, Type II cellular glass with 100-psig or ASTM C591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: ASTM C552, Type II cellular glass with 100-psig or ASTM C591, Type VI, Grade 1 polyisocyanurate with 125-psig minimum compressive strength.

C. For Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

2.3 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type anchors, for use in hardened portland cement concrete, with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
1. Indoor Applications: Zinc-coated or stainless steel.

2. Outdoor Applications: Stainless steel.

2.4 PIPE-POSITIONING SYSTEMS

A. Description: IAPMO PS 42 positioning system composed of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

2.5 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-carbon-steel shapes.

2.6 MATERIALS

A. Aluminum: ASTM B221.

B. Carbon Steel: ASTM A1011/A1011M.

C. Structural Steel: ASTM A36/A36M carbon-steel plates, shapes, and bars; black and galvanized.

D. Stainless Steel: ASTM A240/A240M.

E. Grout: ASTM C1107/C1107M, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 APPLICATION

A. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation, for penetrations through fire-rated walls, ceilings, and assemblies.

B. Strength of Support Assemblies: Where not indicated, select sizes of components, so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

A. Metal Pipe-Hanger Installation: Comply with MSS SP-58. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Thermal Hanger-Shield Installation: Install in pipe hanger or shield for insulated piping.

C. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete, after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete, after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

D. Pipe-Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

E. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

F. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

G. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

H. Install lateral bracing with pipe hangers and supports to prevent swaying.

I. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms, and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports, so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

L. Insulated Piping:

1. Attach clamps and spacers to piping.

a. Piping Operating Above Ambient Air Temperature: Clamp may project through insulation.
b. Piping Operating Below Ambient Air Temperature: Use thermal hanger-shield insert with clamp sized to match OD of insert.

c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39 protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

   a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

   a. Option: Thermal hanger-shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

   a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches long and 0.048 inch thick.
   b. NPS 4 (DN 100): 12 inches long and 0.06 inch thick.
   c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches long and 0.06 inch thick.
   d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches long and 0.075 inch thick.
   e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 (DN 200) and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal Hanger Shields: Install with insulation of same thickness as piping insulation.

3.3 INSTALLATION OF EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment, and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

3.6 PAINTING

A. Touchup: Clean field welds and abraded, shop-painted areas. Paint exposed areas immediately after erecting hangers and supports. Use same materials as those used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded, shop-painted areas on miscellaneous metal are specified in Section 099123 "Interior Painting."

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas, and apply galvanizing-repair paint to comply with ASTM A780/A780M.

3.7 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-58 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finishes.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and attachments for general service applications.

F. Use stainless steel pipe hangers and corrosion-resistant attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal hanger-shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4, to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8.
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8.
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3.
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
15. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction occurs.
16. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24, from single rod if horizontal movement caused by expansion and contraction occurs.
17. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction occurs but vertical adjustment is unnecessary.
18. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 if small horizontal movement caused by expansion and contraction occurs and vertical adjustment is unnecessary.
19. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 if vertical and lateral adjustment during installation, in addition to expansion and contraction, is required.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment of up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11 split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable-Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal Hanger-Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load, and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:

    a. Horizontal (MSS Type 54): Mounted horizontally.
    b. Vertical (MSS Type 55): Mounted vertically.
    c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

P. Comply with MSS SP-58 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

R. Use pipe-positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

SECTION 220548.13 - VIBRATION CONTROLS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Housed-spring isolators.
   2. Spring hangers.
   3. Snubbers.
   4. Post-installed concrete anchors.
   5. Concrete inserts.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

   1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
   2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M, "Structural Welding Code - Steel."

PART 2 - PRODUCTS

2.1 HOUSED-SPRING ISOLATORS: nVent, Kinetics Noise, or Market Intelo

A. Freestanding, Laterally Stable, Open-Spring Isolators in Two-Part Telescoping Housing.

1. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
2. Minimum Additional Travel: 50 percent of the required deflection at rated load.
3. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
4. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
5. Minimum deflection as indicated on Drawings.
6. Two-Part Telescoping Housing: A steel top and bottom frame separated by an elastomeric material and enclosing the spring isolators.

a. Drilled base housing for bolting to structure with an elastomeric isolator pad attached to the underside. Bases shall limit floor load to 500 psi.

2.2 PIPE-RISER RESILIENT SUPPORT

A. All-Directional, Acoustical Pipe Anchor Consisting of Two Steel Tubes Separated by a Minimum 1/2-inch-Thick Neoprene.

1. Vertical-Limit Stops: Steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions.
2. Maximum Load Per Support: 500 psi on isolation material providing equal isolation in all directions.
3. Minimum deflection as indicated on Drawings.

2.3 RESILIENT PIPE GUIDES

A. Telescopic Arrangement of Two Steel Tubes or Post and Sleeve Arrangement Separated by a Minimum 1/2-inch-Thick Neoprene.

1. Factory-Set Height Guide with Shear Pin: Shear pin shall be removable and reinsertable to allow for selection of pipe movement. Guides shall be capable of motion to meet location requirements.

2.4 SPRING HANGERS: nVent, Kinetics Noise, or Market Intelo

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A. Combination Coil-Spring and Elastomeric-Insert Hanger with Spring and Insert in Compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Minimum deflection as indicated on Drawings.
6. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
7. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

2.5 SNUBBERS: nVen, Kinetics Noise, or Mason Industries

A. Description: Factory fabricated using welded structural-steel shapes and plates, anchor bolts, and replaceable resilient isolation washers and bushings.

1. Post-Installed Concrete Anchor Bolts: Secure to concrete surface with post-installed concrete anchors. Anchors to be prequalified in accordance with ACI 355.2 testing and designated in accordance with ACI 318-08 Appendix D for 2009 IBC
2. Preset Concrete Inserts: Prequalified in accordance with ICC-ES AC446 testing.
3. Anchors in Masonry: Design in accordance with TMS 402.
4. Resilient Isolation Washers and Bushings: Oil- and water-resistant neoprene.
5. Resilient Cushion: Maximum 1/4-inch air gap, and minimum 1/4 inch thick.

2.6 POST-INSTALLED CONCRETE ANCHORS

A. Mechanical Anchor Bolts:

1. Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.

B. Adhesive Anchor Bolts:

1. Drilled-in and capsule anchor system containing PVC or urethane methacrylate-based resin and accelerator, or injected polymer or hybrid mortar adhesive. Provide anchor bolts and hardware with zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E488/E488M.

2.7 CONCRETE INSERTS

A. Provide preset concrete inserts that are prequalified in accordance with ICC-ES AC466 testing.

B. Comply with ANSI/MSS SP-58.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Hanger-Rod Stiffeners: Install where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to wind load forces.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength is adequate to carry static forces within specified loading limits.

3.2 INSTALLATION OF VIBRATION-CONTROL DEVICES

A. Provide vibration-control devices for systems and equipment where indicated in Equipment Schedules or Vibration-Control Device Schedules, where indicated on Drawings, or where the Specifications indicate they are to be installed on specific equipment and systems.

B. Coordinate location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 033000 "Cast-in-Place Concrete."

C. Installation of vibration isolators must not cause any stresses, misalignment or change of position of equipment or piping.

D. Comply with requirements in Section 077200 "Roof Accessories" for installation of roof curbs, equipment supports, and roof penetrations.

E. Equipment Restraints:

1. Install snubbers on plumbing equipment mounted on vibration isolators. Locate snubbers as close as possible to vibration isolators and bolt to equipment base and supporting structure.
2. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.

F. Piping Restraints:

1. Comply with requirements in MSS SP-127.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c.
3. Brace a change of direction longer than 12 feet.

G. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

H. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.

I. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

J. Post-Installed Concrete Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify Project structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Mechanical-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL MOTION

A. Provide flexible connections in piping systems where they cross structural joints and other point where differential movement may occur. Provide adequate flexibility to accommodate differential movement as determined in accordance with ASCE/SEI 7. Comply with requirements in Section 221116 "Domestic Water Piping" and Section 221119 "Domestic Water Piping Specialties" for piping flexible connections.

3.4 ADJUSTING

A. Adjust isolators after system is at operating weight.

B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

END OF SECTION 220548.13

SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment-Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch minimum thickness, with predrilled or stamped holes for attachment hardware.
2. Letter and Background Color: As indicated for specific application under Part 3.
3. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
4. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances of up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
5. Fasteners: Stainless steel rivets or self-tapping screws.
6. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.
2. Letter and Background Color: As indicated for specific application under Part 3.
3. Maximum Temperature: Able to withstand temperatures of up to 160 deg F.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances of up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
6. Fasteners: Stainless steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch thick, with predrilled holes for attachment hardware.

B. Letter and Background Color: As indicated for specific application under Part 3.

C. Maximum Temperature: Able to withstand temperatures of up to 160 deg F.

D. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

E. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances of up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

F. Fasteners: Stainless steel rivets or self-tapping screws.

G. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

H. Arc-Flash Warning Signs: Provide arc-flash warning signs in locations and with content in accordance with requirements of OSHA and NFPA 70E, and other applicable codes and standards.

I. Label Content: Include caution and warning information plus emergency notification instructions.

2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color coded, with lettering indicating service and showing flow direction in accordance with ASME A13.1.

B. Letter and Background Color: As indicated for specific application under Part 3.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings. Also include:

1. Pipe size.
2. Flow-Direction Arrows: Include flow-direction arrows on main distribution piping. Arrows may be either integral with label or applied separately.
3. Lettering Size: Size letters in accordance with ASME A13.1 for piping At least 1/2 inch for viewing distances of up to 72 inches and proportionately larger lettering for greater viewing distances.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of incompatible primers, paints, and encapsulants, as well as dirt, oil, grease, release agents, and other substances that could impair bond of identification devices.

3.2 INSTALLATION, GENERAL REQUIREMENTS

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. Locate identifying devices so that they are readily visible from the point of normal approach.

3.3 INSTALLATION OF EQUIPMENT LABELS, WARNING SIGNS, AND LABELS

A. Permanently fasten labels on each item of plumbing equipment.

B. Sign and Label Colors.

1. White letters on an ANSI Z535.1 safety-green background.

C. Locate equipment labels where accessible and visible.

D. Arc-Flash Warning Signs: Provide arc-flash warning signs on electrical disconnects and other equipment where are-flash hazard exists, as indicated on Drawings, and in accordance with requirements of OSHA and NFPA 70E, and other applicable codes and standards.

3.4 INSTALLATION OF PIPE LABELS

A. Piping Color Coding: Painting of piping is specified in Section 099123 "Interior Painting."

B. Install pipe labels showing service and flow direction with permanent adhesive on pipes.

C. Pipe-Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Within 3 ft. of each valve and control device.
2. At access doors, manholes, and similar access points that permit view of concealed piping.
3. Within 3 ft. of equipment items and other points of origination and termination.
4. Spaced at maximum intervals of 25 ft. along each run. Reduce intervals to 10 ft. in areas of congested piping and equipment.

D. Do not apply plastic pipe labels or plastic tapes directly to bare pipes conveying fluids at temperatures of 125 deg F or higher. Where these pipes are to remain uninsulated, use a short section of insulation or use stenciled labels.

E. Flow-Direction Flow Arrows: Use arrows, in compliance with ASME A13.1, to indicate direction of flow in pipes, including pipes where flow is allowed in both directions.

F. Pipe-Label Color Schedule:
1. Domestic Cold-Water Piping: White letters on an ANSI Z535.1 safety-green background.
2. Domestic Hot-Water Piping: White letters on an ANSI Z535.1 safety-green background.
3. Domestic Hot-Water Return Piping White letters on an ANSI Z535.1 safety-green background.
4. Sanitary Waste and Storm Drainage Piping: White letters on a black background.

END OF SECTION 220553

SECTION 220593 - TESTING, ADJUSTING, AND BALANCING FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. TAB of domestic water system.
2. TAB of plumbing equipment:

   a. Domestic hot-water in-line circulation pumps.

3. Pipe-leakage test verification.

1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An independent entity meeting qualifications to perform TAB work.

F. TDH: Total dynamic head.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: Within 60 days of Contractor's Notice to Proceed, submit documentation that the TAB specialist and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Contract Documents Examination Report: Within 60 days of Contractor's Notice to Proceed, submit the Contract Documents review report, as specified in Part 3.

C. Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures, as specified in "Preparation" Article.

D. System Readiness Checklists: Within 60 days of Contractor's Notice to Proceed, submit system readiness checklists, as specified in "Preparation" Article.

E. Examination Report: Submit a summary report of the examination review required in "Examination" Article.

F. Certified TAB reports.

G. Sample report forms.

H. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.4 QUALITY ASSURANCE

A. TAB Specialists Qualifications, Certified by NEBB or TABB:

1. TAB Field Supervisor: Employee of the TAB specialist and certified by NEBB or TABB.
2. TAB Technician: Employee of the TAB specialist and certified by NEBB or TABB.

B. Instrumentation Type, Quantity, Accuracy, and Calibration: Comply with requirements in ASHRAE 111, Section 4, "Instrumentation."

C. Code and Authorities Having Jurisdiction Compliance: TAB is required to comply with governing codes and requirements of authorities having jurisdiction.

1.5 FIELD CONDITIONS

A. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems designs that may preclude proper TAB of systems and equipment.

B. Examine installed systems for balancing devices, such as test ports, gauge cocks, thermometer wells, flow-control devices, and balancing valves and fittings. Verify that locations of these balancing devices are applicable for intended purpose and are accessible.

C. Examine approved submittals for plumbing systems and equipment.

D. Examine design data, including plumbing system descriptions, statements of design assumptions for environmental conditions and systems output, and statements of philosophies and assumptions about plumbing system and equipment controls.

E. Examine equipment performance data, including pump curves.

1. Relate performance data to Project conditions and requirements, including pump system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate pump system-effect factors to reduce performance ratings of plumbing equipment when installed under conditions different from the conditions used to rate equipment performance. Compare results with the design data and installed conditions.

F. Examine system and equipment installations, and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

G. Examine test reports specified in individual system and equipment Sections.

H. Examine plumbing equipment and verify that bearings are greased, belts are aligned and tight, filters are clean, and equipment with functioning controls is ready for operation.

I. Examine temporary and permanent strainers. Verify that temporary strainer screens used during system cleaning and flushing have been removed and permanent strainers are installed and clean.

J. Examine control valves for proper installation for their intended function of isolating, throttling, diverting, or mixing fluid flows.

K. Examine system pumps to ensure absence of entrained air in the suction piping.

L. Examine operating safety interlocks and controls on plumbing equipment.

M. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes the following:

1. Equipment and systems to be tested.
2. Strategies and step-by-step procedures for balancing the systems.

3. Instrumentation to be used.
4. Sample forms with specific identification for all equipment.

B. Perform system-readiness checks of plumbing systems and equipment to verify system readiness for TAB work. Include, at a minimum, the following:

1. Domestic Water System:

a. Verify leakage and pressure tests on water distribution systems have been satisfactorily completed in accordance with applicable code and authority having jurisdiction.
b. Water heaters are installed and functioning.
c. Piping is complete and all points of outlet are installed.
d. Water treatment is complete.
e. Systems are flushed, filled, and air purged.
f. Strainers are clean.
g. Control valves are functioning in accordance with the sequence of operation.
h. Shutoff and balance valves are 100 percent open.
i. hot-water circulating pumps are operational and proper rotation is verified.
j. Pump gauge connections are installed directly at pump inlet and outlet flanges or in discharge and suction pipe prior to valves or strainers.
k. Variable-frequency controllers' startup is complete and safeties are verified.
l. Suitable access to balancing devices and equipment is provided.

2. Sanitary Sewage/Drainage System:

a. Leakage and pressure tests on sanitary sewage/drainage systems have been completed in accordance with applicable code and authority having jurisdiction requirements.
b. Piping is complete.
c. Shutoff valves are 100 percent open.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system in accordance with the procedures contained in NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems" and in this Section.

B. Cut insulation, pipes, and equipment casings for installation of test probes to the minimum extent necessary for TAB procedures.

1. Where holes for probes are required in piping or equipment, install pressure and temperature test plugs to seal systems.
2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish in accordance with Section 220716 "Plumbing Equipment Insulation" and Section 220719 "Plumbing Piping Insulation."

C. Mark equipment and balancing devices, including valve position indicators and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR PLUMBING EQUIPMENT

A. Test, adjust, and balance plumbing equipment indicated on Drawings, including, but not limited to, the following:

1. Domestic water in-line pumps.
2. Domestic water heaters.

3.5 PROCEDURES FOR DOMESTIC WATER SYSTEMS

A. Prepare test reports for pumps and other equipment. Obtain approved submittals and manufacturer-recommended testing procedures. Crosscheck the summation of required equipment flow rates with system design flow rates.

B. Prepare schematic diagrams of systems' Record drawings piping layouts.

C. In addition to requirements in "Preparation" Article, prepare domestic water systems for testing and balancing as follows:

1. Check expansion tank for proper setting.
2. Check water heater for proper discharge temperature setting.
3. Check remotest point of outlet for adequate pressure.
4. Check flow-control valves for proper position.
5. Locate start-stop and disconnect switches, electrical interlocks, and motor controllers.
6. Verify that motor controllers are equipped with properly sized thermal protection.
7. Check that air has been purged from the system.

D. Measure and record upstream and downstream pressure of each piece of equipment.

E. Measure and record upstream and downstream pressure of pressure-reducing valves.

F. Check settings and operation of automatic temperature-control valves, self-contained control valves, and pressure-reducing valves. Record final settings.

G. Check settings and operation of each safety valve. Record settings.

3.6 PROCEDURES FOR DOMESTIC HOT-WATER CIRCULATING INLINE PUMP

A. Balance system with manual or automatic balancing valves by setting at design flow.

1. Measure flow in main and branch pipes.
2. Adjust main and branch balance valves for design flow.
3. Re-measure each main and branch after all have been adjusted.

B. Adjust pump to deliver total design flow.

1. Measure pump TDH as follows:

   a. Measure discharge pressure directly at the pump outlet flange or in discharge pipe prior to any valves.
   b. Measure inlet pressure directly at the pump inlet flange or in suction pipe prior to any valves or strainers.
   c. Convert pressure to head and correct for differences in gauge heights.
   d. Verify pump impeller size by measuring the TDH with the discharge valve closed. Note the point on manufacturer's pump curve at zero flow, and verify that the pump has the intended impeller size.

2. Monitor motor performance during procedures, and do not operate motor in an overloaded condition.
3. Mark final settings and verify that all memory stops have been set.
4. Verify final system conditions as follows:

   a. Re-measure and confirm that total flow is within design.
   b. Re-measure final pumps' operating data, TDH, volts, amps, speed, and static profile.
   c. Mark final settings.

3.7 PROCEDURES FOR WATER HEATERS

A. Electric Water Heaters:

1. Measure and record entering- and leaving-water temperatures.
2. Measure and record water flow.
3. Measure and record pressure drop.
4. Record relief valve(s) pressure setting.
5. Capacity: Calculate in Btu/h of heating output.
6. Efficiency: Calculate operating efficiency for comparison to submitted equipment.

3.8 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.

1. Measure and record flows, temperatures, and pressures of each piece of equipment. Compare the values to design or nameplate information, where information is available.
2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
3. Check the condition of filters.

4. Check bearings and other lubricated parts for proper lubrication.
5. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

B. TAB After Construction: Before performing testing and balancing of renovated existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished in accordance with renovation scope indicated by Contract Documents. Verify the following:

1. New filters are installed.
2. Bearings and other parts are properly lubricated.
3. Deficiencies noted in the preconstruction report are corrected.

3.9 TOLERANCES

A. Set plumbing system's flow rates within the following tolerances:

1. Domestic Water Flow Rate: Plus or minus 10 percent. If design value is less than 10 gpm, within 10 percent.

3.10 PROGRESS REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for system-balancing devices. Recommend changes and additions to system-balancing devices, to facilitate proper performance measuring and balancing. Recommend changes and additions to plumbing systems and general construction to allow access for performance-measuring and -balancing devices.

B. Status Reports: Prepare biweekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.11 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.
3. Certify validity and accuracy of field data.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Manufacturers' test data.
3. Field test reports prepared by system and equipment installers.
4. Other information relative to equipment performance; do not include Shop Drawings and Product Data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB specialist.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents, including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Notes to explain why certain final data in the body of reports vary from indicated values.
14. Test conditions for pump performance forms, including the following:

    a. Variable-frequency controller settings for variable-flow hydronic systems.
    b. Settings for pressure controller(s).
    c. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of distribution systems. Present each system with single-line diagram and include the following:

1. Flow rates.
2. Pipe and valve sizes and locations.
3. Balancing stations.
4. Position of balancing devices.

E. Electric Water Heater Test Reports: In addition to manufacturer's factory startup equipment reports, include the following:

1. Unit Data:

    a. System identification.
    b. Location.

c. Model number and unit size.
d. Manufacturer's serial number.
e. Output capacity in Btu/h.
f. Number of stages.
g. Connected volts, phase, and hertz.
h. Rated amperage.

2. Test Data (Indicated and Actual Values):

a. Heat output in Btu/h.
b. Entering-water temperature in deg F.
c. Leaving-water temperature in deg F.
d. High-temperature-limit setting in deg F.
e. Operating set point in deg F.
f. Voltage at each connection.
g. Amperage for each phase.

F. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves, and include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Service.
d. Make and size.
e. Model number and serial number.
f. Water flow rate in gpm.
g. Water-pressure differential in feet of head or psig.
h. Required net positive suction head in feet of head or psig.
i. Pump speed.
j. Motor make and frame size.
k. Motor horsepower and rpm.
l. Voltage at each connection.
m. Amperage for each phase.
n. Full-load amperage and service factor.
o. Seal type.

G. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

3.12 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

END OF SECTION 220593

SECTION 220719 - PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes insulating the following plumbing piping services:

1. Domestic cold-water piping.
2. Domestic hot-water piping.
3. Domestic recirculating hot-water piping.
4. Sanitary waste piping exposed to freezing conditions.
5. Storm-water piping exposed to freezing conditions.
6. Roof drains and rainwater leaders.
7. Supplies and drains for handicap-accessible lavatories and sinks.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at pipe expansion joints for each type of insulation.
3. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
4. Detail removable insulation at piping specialties, equipment connections, and access panels.
5. Detail application of field-applied jackets.

C. Samples: For each type of insulation and jacket indicated.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Material test reports.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Supply and Drain Protective Shielding Guards: ICC A117.1.

1.5 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

1.6 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products in accordance with ASTM E84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation, jacket materials, adhesive, mastic, tapes, and cement material containers with appropriate markings of applicable testing agency.

1. All Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

2.2 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come into contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested in accordance with ASTM C871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable in accordance with ASTM C795.

E. Glass-Fiber, Preformed Pipe: Glass fibers bonded with a thermosetting resin; suitable for maximum use temperature up to 850 deg F in accordance with ASTM C411. Comply with ASTM C547.

1. Preformed Pipe Insulation: Type I, Grade A**,** unfaced with factory-applied ASJ.
2. Fabricated shapes in accordance with ASTM C450 and ASTM C585.
3. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Glass-Fiber and Mineral Wool Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

C. ASJ Adhesive and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A, for bonding insulation jacket lap seams and joints.

D. PVC Jacket Adhesive: Compatible with PVC jacket.

2.4 MASTICS AND COATINGS

A. Materials shall be compatible with insulation materials, jackets, and substrates.

B. Vapor-Retarder Mastic, Water Based: Suitable for indoor use on below-ambient services.

1. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
2. Service Temperature Range: 0 to plus 180 deg F.
3. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Water-Vapor Permeance: ASTM E96/E96M, greater than 1.0 perm at manufacturer's recommended dry film thickness.
2. Service Temperature Range: 0 to plus 180 deg F.
3. Color: White.

2.5 SEALANTS

A. Materials shall be as recommended by the insulation manufacturer and shall be compatible with insulation materials, jackets, and substrates.

B. Joint Sealants:

1. Permanently flexible, elastomeric sealant.
2. Service Temperature Range: Minus 58 to plus 176 deg F.
3. Color: White or gray.

C. ASJ Flashing Sealants and PVC Jacket Flashing Sealants:

1. Fire- and water-resistant, flexible, elastomeric sealant.
2. Service Temperature Range: Minus 40 to plus 250 deg F.
3. Color: White.

2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C1136, Type II.
4. ASJ+: Aluminum foil reinforced with glass scrim bonded to a kraft paper interleaving with an outer film leaving no paper exposed; complying with ASTM C1136, Types I, II, III, IV, and VII.
5. PSK Jacket: Aluminum foil fiberglass reinforced scrim with polyethylene backing, complying with ASTM C1136, Type II.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C1136, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Adhesive: As recommended by jacket material manufacturer.
2. Color: White.
3. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

D. Self-Adhesive Indoor/Outdoor Jacket (Non-Asphaltic): Vapor barrier and waterproofing jacket for installation over insulation located aboveground outdoors or indoors. Specialized jacket has five layers of laminated aluminum and polyester film with low-temperature acrylic pressure-sensitive adhesive. Outer aluminum surface is coated with UV-resistant coating for protection from environmental contaminants.

1. Permeance: 0.00 perm as tested in accordance with ASTM F1249.
2. Flamespread/Smoke Developed: 25/50 as tested in accordance with ASTM E84.
3. Aluminum Finish: Embossed.

2.8 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Glass-Fiber Mesh: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.

B. Woven Polyester Mesh: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C1136.

1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C1136.

1. Width: 3 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Width: 2 inches.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

2.10 SECUREMENTS

A. Bands:
1. Stainless Steel: ASTM A240/A240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with wing seal.
2. Aluminum: ASTM B209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch-wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, stainless steel.

2.11 PROTECTIVE SHIELDING GUARDS

A. Protective Shielding Pipe Covers:

1. Description: Manufactured plastic wraps for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

B. Protective Shielding Piping Enclosures:

1. Description: Manufactured plastic enclosure for covering plumbing fixture hot- and cold-water supplies and trap and drain piping. Comply with ADA requirements.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate insulation installation with the tradesman installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

B. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and of thicknesses required for each item of pipe system, as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, compress, or otherwise damage insulation or jacket.

D. Install insulation with longitudinal seams at top and bottom (12 o'clock and 6 o'clock positions) of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during storage, application, and finishing. Replace insulation materials that get wet during storage or in the installation process before being properly covered and sealed in accordance with the contract documents.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

   1. Install insulation continuously through hangers and around anchor attachments.
   2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends attached to structure with vapor-barrier mastic.
   3. Install insert materials and insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
   4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

   1. Draw jacket tight and smooth, but not to the extent of creating wrinkles or areas of compression in the insulation.

2. Cover circumferential joints with 3-inch-wide strips, of same material as insulation jacket. Secure strips with adhesive and outward-clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward-clinching staples along edge at 4 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, in accordance with insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches in similar fashion to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials, except where more specific requirements are specified in various pipe insulation material installation articles below.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, Mechanical Couplings, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, mechanical couplings, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered or routed fittings made from same material and density as that of adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as that used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.

4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as that used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers, so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges, mechanical couplings, and unions, using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than 2 times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Stencil or label the outside insulation jacket of each union with the word "union" matching size and color of pipe labels.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket, except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing, using PVC tape.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

3.5 INSTALLATION OF GLASS-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands, and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive, as recommended by insulation material manufacturer, and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install prefabricated pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with glass-fiber or mineral-wool blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
2. When prefabricated insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install prefabricated sections of same material as that of straight segments of pipe insulation when available.
2. When prefabricated sections are not available, install fabricated sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.6 INSTALLATION OF FIELD-APPLIED JACKETS

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch-thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch-wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

3.7 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless steel jackets.

3.8 FIELD QUALITY CONTROL

A. Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections with the assistance of a factory-authorized service representative.

C. Tests and Inspections: Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two number locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.9 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Cold Water:

1. NPS 1 and Smaller: Insulation shall be one of the following:
   a. Glass-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

2. NPS 1-1/4 and Larger: Insulation shall be one of the following:
   a. Glass-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

B. Domestic Hot and Recirculated Hot Water:

1. NPS 1-1/4 and Smaller: Insulation shall be one of the following:
   a. Glass-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

2. NPS 1-1/2 and Larger: Insulation shall be one of the following:
   a. Glass-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

C. Stormwater and Overflow:

1. All Pipe Sizes: Insulation shall be one of the following:
   a. Glass-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

D. Roof Drain and Overflow Drain Bodies:

1. All Pipe Sizes: Insulation shall be one of the following:
   a. Glass-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

E. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:

1. All Pipe Sizes: Insulation shall be one of the following:

   a. Glass-Fiber: Performed Pipe Insulation, Type I: 1 inch thick.

F. Floor Drains, Traps, and Sanitary Drain Piping within 10 Feet of Drain Receiving Condensate and Equipment Drain Water below 60 Deg F:

1. All Pipe Sizes: Insulation shall be one of the following:
   a. Glass-Fiber, Preformed Pipe Insulation, Type I: 1 inch thick.

3.11 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.

D. Piping, Exposed:

1. PVC: 30 mils.

END OF SECTION 220719

SECTION 22 08 00 - COMMISSIONING OF PLUMBING SYSTEMS

PART 1 - GENERAL

1.1 SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned in this project. The Owner and the CxA reserves the right to amend this list at any time during the construction and acceptance process.

Plumbing

1. Plumbing Fixtures
2. Domestic Water Heater
3. Plumbing Metering

1.2 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All of the following sections apply to the Work of this section. General specifications for commissioning responsibilities, abbreviation definitions and reporting requirements are provided in the following sections:

Section 019113 – General Commissioning Requirements

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 FUNCTIONAL TESTING SUPPORT REQUIREMENTS

A. General Requirements

1. This section provides brief descriptions of the testing and support the PC will be required to provide to perform the functional testing of the equipment for the project.
2. A functional performance test shall be performed on each complete system. Each function shall be demonstrated to the satisfaction of the CxA based on the written test procedure developed by the CxA to demonstrate conformance to the requirements of the Contract Documents.
3. Each functional performance test shall be performed, witnessed and signed off by the CxA. The PC will be responsible for providing the required support and representation during this testing. Any exceptions to this will be made clear to the Owner as to the reason and justification.
4. The functional performance testing shall be conducted in accordance with prior approved procedures and documented as required.

B. Plumbing Fixtures

1. All plumbing fixtures will be tested for operation, including verification of proper piping of hot and cold-water supply, fixture operation, water pressure, water temperature and time delay associated with obtaining the required water temperature at the fixture.
2. The installer will confirm and demonstrate that hot water to the fixtures is achieving the required temperature in an appropriate amount of time.
3. The installer is expected to test and verify the operation of every fixture. The CxA will sample approximately 25% of this system.

C. Domestic Water Heaters

1. The contractor(s) will be required to demonstrate all safeties (personnel and mechanical e.g. loss of flow, high temperature, low gas pressure, etc.); local device operation; any local controls, including temperature control.
2. The contractor(s) will be required to monitor and demonstrate the operation of the circulation pumps over a pre-determined time cycle to ensure proper function of the unit (e.g. flow, local controls).
3. The contractor will be required to demonstrate all local controls and required alarms.
4. The BMS contractor will be required to demonstrate any monitored points and alarms.

D. Plumbing Metering

1. The CxA will verify all metering installations.
2. Any required output to the BMS or other metering system will be verified.

END OF SECTION 22 08 00

SECTION 221116 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper tube and fittings - domestic water.
2. Ductile-iron pipe and fittings - domestic water.
3. Piping joining materials - domestic water.
4. Transition fittings - domestic water.
5. Dielectric fittings - domestic water.

1.2 ACTION SUBMITTALS

A. Product data.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Piping layout, or BIM model, drawn to scale, showing the items described in this Section, and coordinated with all building trades.

B. System purging and disinfecting activities report.

C. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Installers of pressure-sealed joints are to be certified by pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Domestic water piping, tubing, fittings, joints, and appurtenances intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act, with requirements of authorities having jurisdiction, and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party

certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PIPING MATERIALS

A. Potable-water piping and components are to comply with NSF 14, NSF 61, and NSF 372.

2.3 COPPER TUBE AND FITTINGS - DOMESTIC WATER

A. Drawn-Temper Copper Tube: ASTM B88, Type K and ASTM B88, Type L.

B. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings. Do not use solder joints on pipe sizes greater than NPS 4.

C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, pressure fittings. Do not use solder joints on pipe sizes greater than NPS 4.

D. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends. Do not use solder joints on pipe sizes greater than NPS 4.

E. Cast Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends. Do not use solder joints on pipe sizes greater than NPS 4.

F. Wrought Copper Unions: ASME B16.22. Do not use solder joints on pipe sizes greater than NPS 4.

2.4 DUCTILE-IRON PIPE AND FITTINGS - DOMESTIC WATER

A. Mechanical-Joint, Ductile-Iron Pipe:

1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Standard-Pattern, Mechanical-Joint Fittings:

1. AWWA C110/A21.10, ductile or gray iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Compact-Pattern, Mechanical-Joint Fittings:

1. AWWA C153/A21.53, ductile iron.

2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

D. Plain-End, Ductile-Iron Pipe: AWWA C151/A21.51.

2.5 PIPING JOINING MATERIALS - DOMESTIC WATER

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B32, lead-free alloys.

D. Flux: ASTM B813, water flushable.

E. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

F. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

2.6 TRANSITION FITTINGS - DOMESTIC WATER

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

2.7 DIELECTRIC FITTINGS - DOMESTIC WATER

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions - Domestic Water:

1. Standard: ASSE 1079.
2. Pressure Rating: 150 psig at 180 deg F.
3. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges - Domestic Water:

1. Standard: ASSE 1079.
2. Factory-fabricated, bolted, companion-flange assembly.
3. Pressure Rating: 150 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits - Domestic Water:

1. Nonconducting materials for field assembly of companion flanges.
2. Pressure Rating: 150 psig.
3. Gasket: Phenolic, Temperature Rating: 225 deg F.
4. Bolt Sleeves: Phenolic or polyethylene.
5. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples - Domestic Water:

1. Standard: IAPMO PS 66.
2. Electroplated steel nipple complying with ASTM F1545.
3. Pressure Rating and Temperature: 300 psig at 225 deg F.
4. End Connections: Male threaded or grooved.
5. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller is to be the following:

1. Annealed-temper copper tube, ASTM B88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

E. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 and larger is to be the following:

1. Annealed-temper copper tube, ASTM B88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

2. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.

F. Aboveground domestic water piping, NPS 2 and smaller is to be the following:

1. Drawn-temper copper tube, ASTM B88, Type; cast- or wrought- copper, solder-joint fittings; and soldered joints.

G. Aboveground domestic water piping, NPS 2-1/2 to NPS 4 is to be the following:

1. Drawn-temper copper tube, ASTM B88, Type L; cast- or wrought- copper, solder-joint fittings; and brazed joints.
2. Galvanized-steel pipe and nipples; galvanized, gray-iron threaded fittings; and threaded joints.

3.2 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab in accordance with CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints in accordance with AWWA C600 and AWWA M41.

D. Install underground copper tube and ductile-iron pipe in PE encasement in accordance with ASTM A674 or AWWA C105/A21.5.

E. Install valves in accordance with Section 220523 "General-Duty Valves for Plumbing Piping."

F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."

G. Install domestic water piping level without pitch and plumb.

H. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

I. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

J. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

K. Install piping to permit valve servicing.

L. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

M. Install piping free of sags and bends.

N. Install fittings for changes in direction and branch connections.

O. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

P. Install pressure gauges on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gauges in Section 220500 "Common Work Results for Plumbing."

Q. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123.21 "Inline, Domestic Water Pumps."

R. Install thermometers on inlet and outlet piping from each water heater. Comply with requirements for thermometers in Section 220500 "Common Work Results for Plumbing."

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220500 "Common Work Results for Plumbing."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

D. Soldered Joints for Copper Tubing: Apply ASTM B813, water-flushable flux to end of tube. Join copper tube and fittings in accordance with ASTM B828 or CDA's "Copper Tube Handbook."

E. Extruded-Tee Connections: Form tee in copper tube in accordance with ASTM F2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.

F. Joint Construction for Grooved-End, Ductile-Iron Piping: Make joints in accordance with AWWA C606. Cut round-bottom grooves in ends of pipe at gasket-seat dimension required for specified (flexible or rigid) joint. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.

G. Joint Construction for Grooved-End Steel Piping: Make joints in accordance with AWWA C606. Square cut groove ends of pipe as specified. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections over gasket with keys seated in piping grooves. Install and tighten housing bolts.

H. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts in accordance with ASME B31.9.

I. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

3.4 INSTALLATION OF TRANSITION FITTINGS

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

3.5 INSTALLATION OF DIELECTRIC FITTINGS

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

3.6 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for seismic-restraint devices specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."

B. Comply with requirements for hangers, supports, and anchor devices in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

C. Install hangers for copper and ductile iron piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

D. Support horizontal piping within 12 inches of each fitting.

E. Support vertical runs of copper and ductile iron pipe to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.7 PIPING CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.

2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system in accordance with either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Repeat procedures if biological examination shows contamination.
    e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
    b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Piping Inspections:

    a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
    b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

        1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after installation and before setting fixtures.
        2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph and to ensure compliance with requirements.

    c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
    d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

    a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
    b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
    c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
    d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
    e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
    f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 221116

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SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Temperature-actuated, water mixing valves.
4. Strainers for domestic water piping.
5. Hose bibbs.
6. Drain valves.
7. Water-hammer arresters.

B. Related Requirements:

1. Section 220500 "Common Work Results for Plumbing."
2. Section 224700 "Drinking Fountains and Water Coolers."

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For domestic water piping specialties.

1. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Test and inspection reports.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Domestic water piping specialties intended to convey or dispense water for human consumption are to comply with the SDWA, requirements of authorities having jurisdiction, and NSF 61 and NSF 372, or to be certified in compliance with NSF 61 and NSF 372 by an American National Standards Institute (ANSI)-accredited third-party certification body that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

2.3 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Standard: ASSE 1001.
2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
3. Body: Bronze.
4. Inlet and Outlet Connections: Threaded.
5. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers:

1. Standard: ASSE 1011.
2. Body: Bronze, nonremovable, with manual drain.
3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
4. Finish: Rough bronze.

2.4 BACKFLOW PREVENTERS (RPZ-1)

A. Reduced-Pressure-Principle Backflow Preventers:

1. Watts LF909-QT-S-FS-2
2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Pressure Loss: 12 psig maximum, through middle third of flow range.
5. Size: 2 NPS.
6. Design Flow Rate: 55 gpm.
7. Selected Unit Flow Range Limits: 0-400 gpm.
8. Pressure Loss at Design Flow Rate: 8-17.5 for NPS 2.
9. Body: Cast copper silicon alloy for NPS 2.

10. End Connections: Flanged for NPS 2.
11. Configuration: Designed for horizontal, straight-through flow.
12. Accessories:

    a. Valves NPS 2: quarter-turn ball valves with flanged ends on inlet and outlet.
    b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

2.5 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Primary, Thermostatic, Water Mixing Valves (MV-1):

1. Lawler 802 or equal.
2. Standard: ASSE 1017.
3. Pressure Rating: 125 psig minimum unless otherwise indicated.
4. Type: Exposed-mounted, thermostatically controlled, water mixing valve.
5. Material: Bronze body with corrosion-resistant interior components.
6. Connections: Threaded inlets and outlet.
7. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
8. Tempered-Water Setting: 120 deg F.
9. Tempered-Water Design Flow Rate: 22 gpm.
10. Selected Valve Flow Rate at 45-psig (310-kPa) Pressure Drop: 60 gpm.
11. Pressure Drop at Design Flow Rate: 3 psig.
12. Valve Finish: Rough bronze.
13. Piping Finish: Copper.

2.6 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller.
3. End Connections: Threaded for NPS 2 and smaller.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:

    a. Strainers NPS 2 and Smaller: 0.020 inch.

6. Drain: Hose-end drain valve.

2.7 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: 400-psig minimum CWP.

3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

2.8 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Watts SG-Series or equal.
2. Standard: PDI-WH 201.
3. Type:0 Piston.
4. Size: Sizes A through F.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING SPECIALTIES

A. Backflow Preventers: Install in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Water Regulators: Install with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gauges on inlet and outlet.

C. Balancing Valves: Install in locations where they can easily be adjusted. Set at indicated design flow rates.

D. Temperature-Actuated, Water Mixing Valves: Install with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install cabinet-type units recessed in or surface mounted on wall as specified.

E. Y-Pattern Strainers: For water, install on supply side of each water pressure-reducing valve and pump.

F. Water-Hammer Arresters: Install in water piping in accordance with PDI-WH 201.

3.2 PIPING CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping specialties adjacent to equipment and machines, allow space for service and maintenance.

3.3 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

3.4 IDENTIFICATION

A. Plastic Labels for Equipment: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated, water mixing valves.

B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.5 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

D. Adjust each pressure vacuum breaker, reduced-pressure-principle backflow preventer in accordance with manufacturer's written instructions, authorities having jurisdiction and the device's reference standard.

3.6 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. Test each pressure vacuum breaker, reduced-pressure-principle backflow preventer, according to authorities having jurisdiction and the device's reference standard.
2. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 221119

SECTION 221123.21 – INLINE, DOMESTIC-WATER PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. In-line, sealless centrifugal pumps.

1.2 ACTION SUBMITTALS

A. Product data.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Detail pumps and adjacent equipment, drawn to scale and coordinated with each other, using input from installers of the items involved.

B. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: UL 778 for motor-operated water pumps.

C. Drinking Water System Components - Health Effects and Drinking Water System Components - Lead Content Compliance: NSF 61 and NSF 372.

2.2 IN-LINE, SEALLESS CENTRIFUGAL PUMPS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Grundfos
   2. Amstrong
   3. Bell and Gossett

B. Description: Factory-assembled and -tested, in-line, close-coupled, canned-motor, sealless, overhung-impeller centrifugal pumps.

C. Capacities and Characteristics: (DP-1 and DP-2)

   1. Capacity: 98 gpm.
   2. Total Dynamic Head: 4.5 feet.
   3. Inlet and Outlet Size: 1-1/4 NPS.
   4. Pump Speed: 2800 rpm.
   5. Pump Control: Thermostat.
   6. Motor Horsepower: 448 Watts.
   7. Electrical Characteristics:

      a. Volts: 120 V.
      b. Phase: Single phase.
      c. Hertz: 60 Hz.

D. Capacities and Characteristics: (DP-3)

   1. Capacity: 49 gpm.
   2. Total Dynamic Head: 23.75 feet.
   3. Inlet and Outlet Size: 1-1/4 NPS.
   4. Pump Speed: 2800 rpm.
   5. Pump Control: Thermostat.
   6. Motor Horsepower: 187 Watts.
   7. Electrical Characteristics:

      a. Volts: 120 V.
      b. Phase: Single phase.
      c. Hertz: 60 Hz.

E. Capacities and Characteristics: (DP-4, DP-5, DP-6, DP-7, DP-8 and DP-9)

   1. Capacity: 22.5 gpm.
   2. Total Dynamic Head: 12.47 feet.
   3. Inlet and Outlet Size: 1-1/4 NPS.
   4. Pump Speed: 2800 rpm.
   5. Pump Control: Thermostat.
   6. Motor Horsepower: 106 Watts.
   7. Electrical Characteristics:

a. Volts: 120 V.
b. Phase: Single phase.
c. Hertz: 60 Hz.

F. Capacities and Characteristics: (DP-10)

1. Capacity: 46.7 gpm.
2. Total Dynamic Head: 17.72 feet.
3. Inlet and Outlet Size: 1-1/4 NPS.
4. Pump Speed: 2800 rpm.
5. Pump Control: Thermostat.
6. Motor Horsepower: 285 Watts.
7. Electrical Characteristics:

a. Volts: 120 V.
b. Phase: Single phase.
c. Hertz: 60 Hz.

G. Pump Construction:

1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge type with motor and impeller on common shaft and designed for installation with pump and motor shaft horizontal.
2. Minimum Working Pressure: 150 psig.
3. Maximum Continuous Operating Temperature: 230 deg F.
4. Casing: Cast iron, with threaded or companion-flange connections.
5. Impeller: Noryl.
6. Motor: Three speed.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220500 "Common Work Results for Plumbing."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

2.4 CONTROLS

A. Thermostats: Electric; adjustable for control of hot-water circulation pump.

1. Type: Water-immersion temperature sensor, for installation in piping.
2. Range: 65 to 200 deg F.
3. Enclosure: NEMA 250, Type 4X.
4. Operation of Pump: On or off.
5. Transformer: Provide if required.

6. Power Requirement: 120 V ac.
7. Settings: Start pump at 110 deg F and stop pump at 120 deg F.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with HI 1.4.

B. Mount pumps in orientation complying with manufacturer's written instructions.

C. Install continuous-thread hanger rods and vibration isolation of size required to support pump weight.

1. Comply with requirements for vibration isolation devices specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment." Fabricate brackets or supports as required.
2. Comply with requirements for hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

D. Install thermostats in hot-water return piping.

E. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment" for identification of pumps.

F. Engage a factory-authorized service representative to perform Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping.
4. Set thermostats for automatic starting and stopping operation of pumps.
5. Perform the following startup checks for each pump before starting:

a. Verify bearing lubrication.
b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
c. Verify that pump is rotating in the correct direction.

6. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
7. Start motor.
8. Open discharge valve slowly.
9. Adjust temperature settings on thermostats.
10. Adjust timer settings.

3.2 PIPING CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to inline, domestic-water pumps, allow space for service and maintenance.

C. Connect domestic-water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.

1. Install flexible connectors adjacent to pumps in suction and discharge piping of the following pumps:

a. Horizontally mounted, in-line, close-coupled centrifugal pumps.
b. Comply with requirements for flexible connectors specified in Section 221116 "Domestic Water Piping."

D. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for strainers specified in Section 221119 "Domestic Water Piping Specialties." Comply with requirements for valves specified in Section 220523 "General-Duty Valves for Plumbing Piping."

1. Install pressure gauge and snubber at suction of each pump and pressure gauge and snubber at discharge of each pump. Install at integral pressure-gauge tappings where provided or install pressure-gauge connectors in suction and discharge piping around pumps. Comply with requirements for pressure gauges and snubbers specified in Section 220500 "Common Work Results for Plumbing."

3.3 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring between temperature controllers and devices.

3.4 FIELD QUALITY CONTROL

A. Testing Agency:

1. Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections with the assistance of a factory-authorized service representative.

C. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Inline, domestic-water pump will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 ADJUSTING

A. Adjust inline, domestic-water pumps to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust initial temperature set points.

C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION 221123.21

SECTION 221316 – SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.
3. Specialty pipe fittings.

1.2 ACTION SUBMITTALS

A. Product data.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and elevations, or Building Information Model (BIM) drawn to scale, showing items described in this Section and coordinated with all building trades.

B. Field quality-control reports.

1.4 WARRANTY

A. Listed manufacturers to provide labeling and warranty of their respective products.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation are capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10 ft. head of water.

2.2 PIPING MATERIALS

A. Piping materials to bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings:

1. Marked with CISPI collective trademark.
2. ASTM A74, service and extra-heavy cast iron.

B. Gaskets: ASTM C564, rubber.

C. Caulking Materials: ASTM B29, pure lead and oakum or hemp fiber.

2.4 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings:

1. Marked with CISPI collective trademark.
2. ASTM A888 or CISPI 301.

B. CISPI, Hubless-Piping Couplings:

1. Standards: ASTM C1277 and CISPI 310.
2. Description: Stainless steel corrugated shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Hubless-Piping Couplings:

1. Standards: ASTM C1277 and ASTM C1540.
2. Description: Stainless steel shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

2.5 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections of same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
3. Unshielded, Nonpressure Transition Couplings:

    a. Standard: ASTM C1173.

b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
c. End Connections: Same size as and compatible with pipes to be joined.
d. Sleeve Materials:

1) For Cast-Iron Soil Pipes: ASTM C564, rubber.
2) For Dissimilar Pipes: ASTM D5926 PVC or other material compatible with pipe materials being joined.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.

1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
2. Use long-turn, double Y-branch, and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.

    a. Straight tees, elbows, and crosses may be used on vent lines.

3. Do not change direction of flow more than 90 degrees.
4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

    a. Reducing size of waste piping in direction of flow is prohibited.

K. Lay buried building waste piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

L. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Waste: Two percent downward in direction of flow for piping NPS 3 and smaller; One percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Waste Piping: Two percent downward in direction of flow.
3. Vent Piping: One percent down toward vertical fixture vent or toward vent stack.

M. Install cast-iron soil piping in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

N. Plumbing Specialties:

1. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.

    a. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping.
    b. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."

2. Install drains in sanitary waste gravity-flow piping.

    a. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."

O. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

P. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."

Q. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 220500 "Common Work Results for Plumbing."

R. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

3.3 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hub-and-Spigot, Cast-Iron Soil Piping Caulked Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for lead-and-oakum caulked joints.

C. Hubless, Cast-Iron Soil Piping Coupled Joints:

1. Join hubless, cast-iron soil piping in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

D. Joint Restraints and Sway Bracing:

1. Provide joint restraints and sway bracing for storm drainage piping joints to comply with the following conditions:

a. Provide axial restraint for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction, branches, and changes in diameter greater than two pipe sizes.
b. Provide rigid sway bracing for pipe and fittings 4 inches and larger, upstream and downstream of all changes in direction 45 degrees and greater.
c. Provide rigid sway bracing for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction and branch openings.

3.4 INSTALLATION OF SPECIALTY PIPE FITTING

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.
2. In Waste Drainage Piping: Unshielded, nonpressure transition couplings.

3.5 INSTALLATION OF VALVES

A. General valve installation requirements for general-duty valve installation are specified in Section 220523 "General-Duty Valves for Plumbing Piping."

3.6 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment"

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install stainless steel pipe hangers for horizontal piping in corrosive environments.
3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42 clamps.
6. Install individual, straight, horizontal piping runs:

    a. 100 Ft. (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Ft. (30 m): MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Ft. (30 m) if Indicated: MSS Type 49, spring cushion rolls.

7. Multiple, Straight, Horizontal Piping Runs 100 Ft. (30 m) or Longer: MSS Type 44 pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52 spring hangers.

B. Install hangers for cast-iron soil piping, with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

D. Support vertical runs of cast-iron soil piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect waste and vent piping to the following:

1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Equipment: Connect waste piping as indicated.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections in accordance with the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.8 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary waste and vent piping in accordance with procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.

   a. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.

   a. Close openings in piping system and fill with water to point of overflow, but not less than 10 ft. head of water.
   b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
   c. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.

   a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1 inch wg.
   b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
   c. Air pressure must remain constant without introducing additional air throughout period of inspection.
   d. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

3.10 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Repair damage to adjacent materials caused by waste and vent piping installation.

3.11 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 and smaller are to be any of the following:

1. Service Class cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings[and hubless, single-stack aerator fittings; CISPI hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

C. Aboveground, soil and waste piping NPS 5 and larger are to be any of the following:

1. Service cast iron, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings and hubless, single-stack aerator fittings; CISPI hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

D. Aboveground, vent piping NPS 4 and smaller is to be any of the following:

1. Service cast iron, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

E. Aboveground, vent piping NPS 5 and larger is to be any of the following:

1. Service cast iron, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

F. Underground, soil, waste, and vent piping NPS 4 and smaller are to be any of the following:

1. Extra-heavy cast-iron soil piping; gaskets; and gasketed joints.
2. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

G. Underground, soil and waste piping NPS 5 and larger are to be any of the following:

1. Extra-heavy, cast-iron soil piping; gaskets; and gasketed joints.
2. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION 221316

SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cleanouts.
2. Miscellaneous sanitary drainage piping specialties.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Show fabrication and installation details for frost-resistant vent terminals.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For sanitary waste piping specialties to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTIONS

A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic sanitary waste piping specialty components.

2.2 CLEANOUTS

A. Cast-Iron Exposed Cleanouts:

1. Standard: ASME A112.36.2M.
2. Size: Same as connected drainage piping.
3. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
4. Closure: Countersunk, brass plug.
5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Exposed Floor Cleanouts:

1. Standard: ASME A112.36.2M for adjustable housing cleanout.
2. Size: Same as connected branch.
3. Type: Adjustable housing.
4. Body or Ferrule: Cast iron.
5. Closure: Brass plug with straight threads and gasket.
6. Adjustable Housing Material: Cast iron with threads.
7. Frame and Cover Material and Finish: Polished bronze.
8. Frame and Cover Shape: Round.
9. Top-Loading Classification: Heavy Duty.
10. Riser: ASTM A74, Service Class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Standard: ASME A112.36.2M. Include wall access.
2. Size: Same as connected drainage piping.
3. Body: Hub-and-spigot, cast-iron soil pipe T-branch or Hubless, cast-iron soil pipe test tee as required to match connected piping.
4. Closure Plug:

    a. Brass.
    b. Countersunk head.
    c. Drilled and threaded for cover attachment screw.
    d. Size: Same as or not more than one size smaller than cleanout size.

5. Wall Access, Cover Plate: Round, deep, chrome-plated bronze cover plate with screw.
6. Wall Access, Frame and Cover: Round, nickel-bronze wall-installation frame and cover.

2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Floor-Drain, Inline Trap Seal:

1. Description: Inline floor drain trap seal, forming a physical barrier to slow trap evaporation while not impeding flow from drain.
2. Material: Polymer
3. Standard: Tested and certified in accordance with ASSE 1072.
4. Listing: ICC-ES or IAPMO listed.
5. Size: Same as floor drain outlet.

B. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device that forms sleeve for pipe floor penetraions of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inches above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

C. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

D. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

D. Assemble open drain fittings and install with top of hub 1 inch above floor.

E. Install deep-seal traps on floor drains and other waste outlets, if indicated.

F. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

G. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.

H. Install vent caps on each vent pipe passing through roof.

I. Install wood-blocking reinforcement for wall-mounting-type specialties.

J. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

3.2 PIPING CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment, to allow service and maintenance.

3.3 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

1. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

SECTION 221319.13 - SANITARY DRAINS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Floor drains.

1.2 DEFINITIONS

A. ABS: Acrylonitrile-butadiene styrene.

B. FRP: Fiberglass-reinforced plastic.

C. HDPE: High-density polyethylene.

D. PE: Polyethylene.

E. PP: Polypropylene.

F. PVC: Polyvinyl chloride.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 DRAIN ASSEMBLIES

A. Sanitary drains shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic sanitary piping specialty components.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains>:

1. Zurn Z415B or similar

2. Standard: ASME A112.6.3 with backwater valve.
3. Pattern: Floor drain.
4. Body Material: Gray iron.
5. Anchor Flange: Required.
6. Outlet: Bottom.
7. Backwater Valve: Drain-outlet type
8. Top or Strainer Material: Bronze.
9. Top of Body and Strainer Finish: Polished bronze.
10. Top Shape: Round.
11. Trap Material: Cast iron.
12. Trap Pattern: Standard P-trap.

B. Cast-Iron Floor Sinks:
1. Standard: ASME A112.6.7.
2. Pattern: Floor drain.
3. Body Material: Cast iron.
4. Anchor Flange: Not required.
5. Clamping Device: Required.
6. Outlet: Bottom, no-hub, connection.
7. Coating on Interior Surfaces: Not required.
8. Sediment Bucket: Not required.
9. Internal Strainer: Dome.
10. Internal Strainer Material: Aluminum.
11. Top Grate Material: Cast iron, loose.
12. Top of Body and Grate Finish: Nickel bronze.
13. Top Shape: Square.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage.

3. Install floor-drain flashing collar or flange, so no leakage occurs between drain and adjoining flooring.

a. Maintain integrity of waterproof membranes where penetrated.

3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Comply with requirements in Section 221319 "Sanitary Waste Piping Specialties" for backwater valves, air admittance devices and miscellaneous sanitary drainage piping specialties.

C. Install piping adjacent to equipment to allow service and maintenance.

3.3 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.4 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319.13

SECTION 221414 - STORM DRAINAGE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Hub-and-spigot, cast-iron soil pipe and fittings.
2. Hubless, cast-iron soil pipe and fittings.
3. Specialty pipe fittings.

1.2 ACTION SUBMITTALS

A. Product data.

B. Shop Drawings: For controlled-flow roof drainage system. Include calculations, plans, sections, elevations, and details.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans and elevations, or Building Information Model (BIM) drawn to scale, showing items described in this Section and coordinated with all building trades.

B. Field Quality-Control Reports: Inspection reports signed by authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Provide materials bearing label, stamp, or other markings of specified testing agency.

1.5 WARRANTY

A. Listed manufacturers to provide labeling and warranty of their respective products

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Components and installation are to be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water.

2.2 PIPING MATERIALS

A. Piping materials to bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.3 HUB-AND-SPIGOT, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Standard: ASTM A74.
3. Class: Service weight cast iron.

B. Gaskets: ASTM C564, rubber.

2.4 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Standards: ASTM A888 and CISPI 301.

B. Standard, Hubless-Piping Couplings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Standards: ASTM C1277 and CISPI 310.
3. Description: Stainless steel corrugated shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Hubless-Piping Couplings:

1. Standard: ASTM C1277 or ASTM C1540.
2. Description: Stainless steel shield with stainless steel bands and tightening devices; and ASTM C564, rubber sleeve with integral, center pipe stop.

D. Cast-Iron, Hubless-Piping Couplings:

1. Standard: ASTM A1056.
2. Description: Two-piece ASTM A48/A48M, cast-iron housing; stainless steel bolts and nuts; and ASTM C564, rubber sleeve with integral, center pipe stop.

2.5 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections of same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Unshielded, Nonpressure Transition Couplings:

a. Standard: ASTM C1173.
b. Description: Elastomeric sleeve, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
c. Sleeve Materials:

1) For Cast-Iron Soil Pipes: ASTM C564 rubber.
2) For Dissimilar Pipes: ASTM D5926 PVC or other material compatible with pipe materials being joined.

PART 3 - EXECUTION

3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

3.2 INSTALLATION OF PIPING

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

B. Install piping as indicated unless deviations from layout are approved on coordination drawings.

C. Install piping in concealed locations.

1. Piping installed in equipment rooms, service areas, and where indicated may be exposed.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Make changes in direction for piping using appropriate branches, bends, and long-sweep bends.

1. Do not change direction of flow more than 90 degrees.
2. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

a. Reducing size of drainage piping in direction of flow is prohibited.

L. Lay buried building piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

M. Install piping at the following minimum slopes unless otherwise indicated.

1. Building Storm Drain: 1/4 inch per foot downward in direction of flow for piping NPS 3 and smaller; 1/8 inch per foot downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Storm Drainage Piping: 1/4 inch per foot downward in direction of flow.

N. Install cast-iron soil piping in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Ch IV, "Installation of Cast Iron Soil Pipe and Fittings."

O. Install engineered controlled-flow drain specialties and storm drainage piping in locations indicated.

P. Plumbing Specialties:

1. Install cleanouts in storm drainage gravity-flow piping in accessible locations.

a. Install cleanout fitting with closure plug inside the building in storm drainage force-main piping.
b. Comply with requirements for cleanouts specified in Section 221423 "Storm Drainage Piping Specialties."

2. Install drains in storm drainage gravity-flow piping.

a. Comply with requirements for drains specified in Section 221423 "Storm Drainage Piping Specialties."

Q. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

R. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220500 "Common Work Results for Plumbing."

S. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 220500 "Common Work Results for Plumbing."

T. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 220500 "Common Work Results for Plumbing."

3.3 JOINT CONSTRUCTION

A. Hub-and-Spigot, Cast-Iron Soil Piping Gasketed Joints: Join in accordance with CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Hubless, Cast-Iron Soil Piping Coupled Joints: Join in accordance with CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

C. Threaded Joints: Thread pipe with tapered pipe threads in accordance with ASME B1.20.1.

1. Cut threads full and clean using sharp dies.
2. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

a. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
b. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
c. Do not use pipe sections that have cracked or open welds.

D. Grooved Joints: Cut groove ends of pipe in accordance with AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fittings. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

E. Flanged Joints: Align bolt holes. Select appropriate gasket material, size, type, and thickness. Install gasket concentrically positioned. Use suitable lubricants on bolt threads. Torque bolts in cross pattern.

F. Joint Restraints and Sway Bracing:

1. Provide joint restraints and sway bracing for storm drainage piping joints to comply with the following conditions:

    a. Provide axial restraint for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction, branches, and changes in diameter greater than two pipe sizes.
    b. Provide rigid sway bracing for pipe and fittings 4 inches and larger, upstream and downstream of all changes in direction 45 degrees and greater.
    c. Provide rigid sway bracing for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction and branch openings.

3.4 INSTALLATION OF SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.
2. In Drainage Piping: Unshielded, nonpressure transition couplings.

B. Dielectric Fittings:

1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
2. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric unions.
3. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric `.
4. Dielectric Fittings for NPS 5 (DN 125) and Larger: Use dielectric flange kits.

3.5 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements for hangers, supports, and anchor devices specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install pipe hangers for horizontal piping in corrosive environments.
3. Install pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42, clamps.
6. Install individual, straight, horizontal piping runs:

    a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet (30 m) if Indicated: MSS Type 49, spring cushion rolls.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install hangers for cast-iron piping with maximum horizontal spacing and minimum rod diameters, to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent.

C. Support horizontal piping and tubing within 12 inches of each fitting and coupling.

D. Support vertical cast-iron piping to comply with MSS SP-58, locally enforced codes, and authorities having jurisdiction requirements, whichever are most stringent, but as a minimum at base and at each floor.

3.6 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections in accordance with the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.7 IDENTIFICATION

A. Identify exposed storm drainage piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.8 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.

2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test storm drainage piping in accordance with procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

   a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved.

   a. Expose work that was covered or concealed before it was tested.

3. Test Procedure:

   a. Test storm drainage piping on completion of roughing-in.
   b. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
   c. From 15 minutes before inspection starts until completion of inspection, water level must not drop.
   d. Inspect joints for leaks.

4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.9 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

3.10 PROTECTION

A. Protect piping and drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of day and when work stops.

C. Repair damage to adjacent materials caused by storm drainage piping installation.

3.11 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground storm drainage piping NPS 6 and smaller is to be any of the following:

1. Service weight, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

C. Aboveground, storm drainage piping NPS 8 and larger is to be any of the following:

1. Service weight, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

D. Underground storm drainage piping NPS 6 and smaller is to be any of the following:

1. Service weight, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

E. Underground, storm drainage piping NPS 8 and larger is to be any of the following:

1. Service weight, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.
3. Dissimilar Pipe-Material Couplings: Unshielded, nonpressure transition couplings.

END OF SECTION 221414

SECTION 221423 - STORM DRAINAGE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. General-purpose roof drains.
2. Deck roof drains
3. Miscellaneous storm drainage piping specialties.
4. Cleanouts.

1.2 ACTION SUBMITTALS

A. Product Data:

1. General-purpose roof drains.
2. Deck roof drains.
3. Miscellaneous storm drainage piping specialties.
4. Cleanouts.

1.3 QUALITY ASSURANCE

A. Provide drainage piping specialties are to bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 GENERAL-PURPOSE ROOF DRAINS

A. Cast-Iron Roof Drains.

1. Cast-Iron, Main Roof Drains:(RD-1).

a. Zurn Z100
b. Standard: ASME A112.6.4.
c. Body Material: Cast iron.
d. Dimension of Body: Nominal 12-inch diameter.
e. Dome Material: Cast iron.
f. Combination flashing ring and gravel stop.
g. Main Outlet: Bottom.

h. Outlet Type: No-hub, Inside caulk or Threaded.
i. Options:
   1) Extension collars.
   2) Underdeck clamp.
   3) Expansion joint.
   4) Sump receiver plate.
   5) Perforated Gravel Guard: Stainless steel.

2.2 CLEANOUTS

A. Cast-Iron Cleanouts.

1. Cast-Iron Exposed Cleanouts:

   a. Standard: ASME A112.36.2M.
   b. Size: Same as connected branch.
   c. Body Material: Hub-and-spigot, cast-iron soil pipe T-branch or No-hub, cast-iron soil pipe test tee as required to match connected piping.
   d. Closure: Countersunk, brass plug.
   e. Closure Plug Size: Same as, or not more than, one size smaller than cleanout size.

2. Cast-Iron Wall Cleanouts:

   a. Standard: ASME A112.36.2M. Include wall access.
   b. Size: Same as connected drainage piping.
   c. Body: Hub-and-spigot, cast-iron soil pipe T-branch or No-hub, cast-iron soil pipe test tee as required to match connected piping.
   d. Closure Plug:

      1) Material: Brass.
      2) Head: Countersunk.
      3) Drilled and threaded for cover attachment screw.
      4) Size: Same as, or not more than, one size smaller than cleanout size.
   e. Wall-Access Cover Plate: Round, deep, chrome-plated bronze cover plate with screw.

3. Cast-Iron Test Tees:

   a. Standard: ASME A112.36.2M and ASTM A74, ASTM A888, or CISPI 301.
   b. Size: Same as connected drainage piping.
   c. Body Material: Hub-and-spigot, cast-iron soil-pipe T-branch or no-hub, cast-iron soil-pipe test tee as required to match connected piping.
   d. Closure Plug: Countersunk, brass.
   e. Closure Plug Size: Same as, or not more than, one size smaller than cleanout size.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install roof drains in accordance with roof membrane manufacturer's written installation instructions at low points of roof areas.

1. Install flashing collar or flange of roof drain to maintain integrity of waterproof membranes where penetrated.
2. Install expansion joints, if indicated, in roof drain outlets.
3. Position roof drains for easy access and maintenance.

B. Install downspout nozzles at exposed bottom of conductors where they spill onto grade.

C. Install cleanouts in aboveground piping and building drain piping in accordance with the following instructions unless otherwise indicated:

1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
3. Locate cleanouts at minimum intervals of 50 ft. for piping NPS 4 and smaller and 100 ft. for larger piping.
4. Locate cleanouts at base of each vertical storm piping conductor.

D. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

E. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

F. Install test tees in vertical conductors and near floor.

G. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

3.2 CONNECTIONS

A. Comply with requirements for piping specified in Section 221414 "Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

3.3 INSTALLATION OF FLASHING

A. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

3.4 CLEANING

A. Clean piping specialties during installation and remove dirt and debris as work progresses.

3.5 PROTECTION

A. Protect piping specialties during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of each day and when work stops.

END OF SECTION 221423

SECTION 221429 - SUMP PUMPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sump pumps - pedestal.

1.2 ACTION SUBMITTALS

A. Product data.

B. Product Data Submittals:

1. Construction details, material descriptions, dimensions of individual components and profiles.
2. Rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

C. Shop Drawings:

1. Plans, elevations, sections, and mounting details.
2. Details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1. Indicate actual installed items by marking submittals with an arrow or box.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Retain shipping flange protective covers and protective coatings during storage.

B. Protect bearings and couplings against damage.

C. Comply with manufacturer's written instructions for handling.

1.5 WARRANTY

A. Manufacturer Warranty: Manufacturer and Installer agree to repair or replace sump pumps that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 3 year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

B. UL Compliance: Comply with UL 778 for motor-operated water pumps.

2.2 SUMP PUMPS - PEDESTAL

A. Sump Pumps - Pedestal: (SP-1)

1. Description: Factory-assembled and -tested, automatic-operation, freestanding, sump-pump unit.
2. Pump Type: Wet-pit-volute, single-stage, separately coupled, overhung-impeller centrifugal sump pump, configured as a pedestal pump. Sump pump to be as defined in HI 14.1-14.2 and HI 14.3.
3. Pump Casing: Corrosion-resistant material, with strainer inlet; design that permits flow into impeller; and vertical discharge for piping connection.
4. Impeller: Aluminum, brass, or plastic.
5. Motor: With built-in overload protection and mounted vertically on sump-pump column.
6. Power Cord: Three-conductor waterproof cable of length required, but not less than 72 inches, with grounding plug and cable-sealing assembly for connection at pump.
7. Capacities and Characteristics:

a. Capacity: 44 gpm.
b. Total Dynamic Head: 5 feet
c. Discharge Size: 1-1/2 NPS.
d. Electrical Characteristics:

1) Motor Horsepower: 1/3 hp.
2) Volts: 115 V ac.
3) Phases: Single.
4) Hertz: 60.

8. Control: Float switch.

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220500 "Common Work Results for Plumbing."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Pump Installation Standards: Comply with HI 14.4 for installation of sump pumps.

B. Equipment Mounting:

1. Comply with requirements for vibration isolation devices specified in Section 220548.13 "Vibration Controls for Plumbing Piping and Equipment."

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

3.2 PIPING CONNECTIONS

A. Comply with requirements for piping specified in Section 221414 "Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to equipment, allow space for service and maintenance.

3.3 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks in accordance with manufacturer's written instructions.

3.4 ADJUSTING

A. Adjust pumps to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust control set points.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain controls and pumps.

END OF SECTION 221429

SECTION 223300 - ELECTRIC, DOMESTIC-WATER HEATERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Commercial, electric, domestic-water booster heaters.
2. Commercial, electric, storage, domestic-water heaters.
3. Commercial, light-duty, storage, electric, domestic-water heaters.
4. Residential, electric, storage, domestic-water heaters.
5. Flow-control, electric, tankless, domestic-water heaters.
6. Thermostat-control, electric, tankless, domestic-water heaters.
7. Domestic-water heater accessories.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include diagrams for power, signal, and control wiring.

1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Equipment room drawing or BIM model, drawn to scale and coordinated with all building trades.

B. Seismic Qualification Data: Certificates, for commercial domestic-water heaters, accessories, and components, from manufacturer.

C. Product Certificates: For each type of commercial, electric, domestic-water heater.

D. Domestic-Water Heater Labeling: Certified and labeled by testing agency acceptable to authorities having jurisdiction.

E. Source quality-control reports.

F. Field quality-control reports.

G. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 COORDINATION

A. Coordinate sizes and locations of concrete bases with actual equipment provided.

1.6 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of electric, domestic-water heaters that fail in materials or workmanship within specified warranty period.

1. Warranty Periods: From date of Substantial Completion.

a. Commercial, Electric, Storage, Domestic-Water Heaters:

1) Storage Tank: Five years.
2) Controls and Other Components: Five years.

b. Expansion Tanks: Five years.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

B. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1.

C. ASME Compliance: Where ASME-code construction is indicated, fabricate and label commercial, domestic-water heater storage tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

D. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 and NSF 372.

2.2 COMMERCIAL, ELECTRIC, DOMESTIC-WATER HEATERS

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A. Commercial, Electric, Storage, Domestic-Water Heaters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Lochinvar, LLC
   b. Smith, A.O. Corporation
   c. Hubbell Water Heaters
2. Standard: UL 1453.
3. Storage-Tank Construction: ASME-code, steel vertical arrangement.

   a. Tappings: Factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.

      1) NPS 2 and Smaller: Threaded ends in accordance with ASME B1.20.1.
      2) NPS 2-1/2 and Larger: Flanged ends in accordance with ASME B16.5 for steel and stainless steel flanges, and in accordance with ASME B16.24 for copper and copper-alloy flanges.

   b. Pressure Rating: 150 psig.
   c. Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending lining material into tappings.

4. Factory-Installed, Storage-Tank Appurtenances:

   a. Anode Rod: Replaceable magnesium.
   b. Drain Valve: Corrosion-resistant metal with hose-end connection.
   c. Insulation: Comply with ASHRAE/IES 90.1.
   d. Jacket: Steel with enameled finish or high-impact composite material.
   e. Heating Elements: Electric, screw-in or bolt-on immersion type arranged in multiples of three.
   f. Temperature Control: Adjustable thermostat.
   g. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
   h. Relief Valves: ASME rated and stamped for combination temperature-and-pressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than working-pressure rating of domestic-water heater. Select one relief valve with sensing element that extends into storage tank.

5. Special Requirements: NSF 5 construction.

B. Capacity and Characteristics:

1. Capacity: 300 gal.
2. Recovery: 590 gph at 100 deg F temperature rise.
3. Temperature Setting: 140 deg F.
4. Power Demand: 144 kilowatts.
5. Heating Elements:

   a. Number of Elements: Eight.
   b. Kilowatts Each Element: 18 kilowatts.

c. Number of Stages: Three.

6. Electrical Characteristics:

a. Volts: 480 V.
b. Phases: Three.
c. Hertz: 60 Hz.
d. Full-Load Amperes:174 A.
e. Minimum Circuit Ampacity: 217.5 A.
f. Maximum Overcurrent Protection: 225 A.

2.3 DOMESTIC-WATER HEATER ACCESSORIES

A. Domestic-Water Expansion Tanks:

1. Manufacturers: : Subject to compliance with requirements, provide products by one of the following:
   a. Thrush Co, Inc
   b. Amtrol
   c. Bell and Gossett
2. Description: Steel pressure-rated tank constructed with welded joints and factory-installed, butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
3. Construction:

   a. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
   b. Interior Finish: Comply with NSF 61 and NSF 372 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
   c. Air-Charging Valve: Factory installed.

4. Capacity and Characteristics:

   a. Working-Pressure Rating: 150 psig.
   b. Capacity Acceptable: 5.3 gal minimum.
   c. Air Precharge Pressure: 12psi.

B. Drain Pans: Corrosion-resistant metal with raised edge. Include dimensions not less than base of domestic-water heater, and include drain outlet not less than NPS 3/4 with ASME B1.20.1 pipe threads.

C. Piping-Type Heat Traps: Field-fabricated piping arrangement in accordance with ASHRAE/IES 90.1

D. Heat-Trap Fittings: ASHRAE/IES 90.1

E. Pressure-Reducing Valves: ASSE 1003 for water. Set at 25-psig- maximum outlet pressure unless otherwise indicated.

F. Combination Temperature-and-Pressure Relief Valves: ASME rated and stamped. Include relieving capacity at least as great as heat input, and include pressure setting less than working-pressure rating of domestic-water heater. Select relief valves with sensing element that extends into storage tank.

G. Pressure Relief Valves: ASME rated and stamped. Include pressure setting less than working-pressure rating of domestic-water heater.

H. Vacuum Relief Valves: ANSI Z21.22/CSA 4.4.

I. Shock Absorbers: ASSE 1010 or PDI-WH 201, Size A water hammer arrester.

2.4 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect domestic-water heaters specified to be ASME-code construction, in accordance with ASME Boiler and Pressure Vessel Code.

B. Hydrostatically test commercial domestic-water heaters to minimum of one and one-half times pressure rating before shipment.

C. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 DOMESTIC-WATER HEATER INSTALLATION

A. Commercial, Electric, Domestic-Water Heater Mounting: Install commercial, electric, domestic-water heaters on concrete base. Comply with requirements for concrete bases specified in Section 033000 "Cast-in-Place Concrete."

1. Exception: Omit concrete bases for commercial, electric, domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
2. Maintain manufacturer's recommended clearances.
3. Arrange units so controls and devices that require servicing are accessible.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

7. Install anchor bolts to elevations required for proper attachment to supported equipment.
8. Anchor domestic-water heaters to substrate.

B. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend domestic-water heater relief-valve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.

C. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains. Install hose-end drain valves at low points in water piping for electric, domestic-water heaters that do not have tank drains. Comply with requirements for hose-end drain valves specified in Section 221119 "Domestic Water Piping Specialties."

D. Install thermometers on outlet piping of electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220500 "Common Work Results for Plumbing."

E. Install thermometers on inlet and outlet piping of residential, solar, electric, domestic-water heaters. Comply with requirements for thermometers specified in Section 220500 "Common Work Results for Plumbing."

F. Assemble and install inlet and outlet piping manifold kits for multiple electric, domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each electric, domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater inlet and outlet, and throttling valve in each electric, domestic-water heater outlet. Comply with requirements for valves specified in Section 220523 "General-Duty Valves for Plumbing Piping" and comply with requirements for thermometers specified in Section 220500 "Common Work Results for Plumbing."

G. Install pressure-reducing valve with integral bypass relief valve in electric, domestic-water booster-heater inlet piping and water hammer arrester in booster-heater outlet piping. Set pressure-reducing valve for outlet pressure of 25 psig. Comply with requirements for pressure-reducing valves and water hammer arresters specified in Section 221119 "Domestic Water Piping Specialties."

H. Install piping-type heat traps on inlet and outlet piping of electric, domestic-water heater storage tanks without integral or fitting-type heat traps.

I. Fill electric, domestic-water heaters with water.

J. Charge domestic-water expansion tanks with air to required system pressure.

K. Install dielectric fittings in all locations where piping of dissimilar metals is to be joined. The wetted surface of the dielectric fitting contacted by potable water to contain less than 0.25 percent of lead by weight.

L. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

3.2 PIPING CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to electric, domestic-water heaters, allow space for service and maintenance of water heaters. Arrange piping for easy removal of domestic-water heaters.

3.3 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections with the assistance of a factory-authorized service representative.

C. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Electric, domestic-water heaters will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain commercial, electric, domestic-water heaters. Training to be a minimum of two hour(s).

END OF SECTION 223300

SECTION 224200 - COMMERCIAL PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Commercial lavatories.
2. Commercial urinals.
3. Commercial water closets.
4. Flushometer valves.
5. Toilet seats.
6. Fixture carriers.

B. Related Requirements:

1. Section 114000 "Foodservice Equipment" for NSF-compliant foodservice and handwash sinks.

1.2 ACTION SUBMITTALS

A. Product data.

B. Shop Drawings:

1. Plans, elevations, sections, and mounting details.
2. Details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Diagrams for power, signal, and control wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Lavatory faucets, sink faucets, shower valves, and wash fountain spray heads and faucets intended to convey or dispense water for human consumption are to comply with the U.S. Safe

Drinking Water Act (SDWA), with requirements of the Authority Having Jurisdiction (AHJ), and with NSF 61 and NSF 372, or be certified in compliance with NSF 61 and NSF 372 by an ANSI-accredited third-party certification body, in that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2.2 COMMERCIAL LAVATORIES

A. Lavatories:

1. Lavatory, refer to A series drawings.

B. Lavatory Faucets, Automatically Operated:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Sloan Valve Company
   b. Kohler Co.
   c. Chicago Faucets; Geberit Company.
2. Standards: ASME A112.18.1/CSA B125.1 and UL 1951.
3. Operation Type: Hardwired electronic sensor operated, mixing.
4. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
5. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
6. Body Type: Single hole.
7. Body Material: Commercial, solid-brass, or die-cast housing with brazed copper and brass waterway.
8. Finish: Polished chrome plate.
9. Maximum Flow Rate: 0.5 gpm.
10. Mounting Type: Deck, concealed.
11. Drain: Not part of faucet.

C. Lavatory Supply Fittings:

1. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.
2. Standard: ASME A112.18.1/CSA B125.1.
3. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless steel wall flange.
4. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
5. Operation: Loose key.
6. Risers:

a. NPS 3/8.
b. ASME A112.18.6/CSA B125.6, braided or corrugated stainless steel, flexible hose riser.

D. Lavatory Waste Fittings:

1. Standard: ASME A112.18.2/CSA B125.2.
2. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.
3. Trap:

a. Size: NPS 1-1/2.
b. Material:

1) Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- thick brass tube to wall; and chrome-plated, brass or steel wall flange.

2.3 COMMERCIAL SINKS

A. Mop Sinks, Floor Mounted:

1. Mop Sinks, Floor Mounted - Terrazzo:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1) Stern Williams Co., Inc
2) Acorn Engineering Company; a Division of Morris Group International
3) Florestone Products Co., Inc.
b. Source Limitations: Obtain sinks from single source from single manufacturer.
c. Fixture:

1) Material: Marble chips cast in portland cement to produce a compressive strength of not less than 3000 psi, seven days after casting.
2) Shape: Square.
3) Nominal Size: 24 by 24 inches.
4) Height: 12 inches with dropped front.
5) Rim Guard: On all top surfaces.
6) Drain: Grid with NPS 3 outlet.

d. Mounting: On floor and flush to wall.
1) Installation according to manufacturer's instructions.

2. Mop Sink Faucets, Manually Operated :

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1) American Standard
2) Bradley Corporation
3) Chicago Faucets; Geberit Compnay

b. Source Limitations: Obtain sink faucets from single source from single manufacturer.
c. Description: Wall/back mounted, brass body, with integral service stops, checks, spout with bucket/pail hook, 3/4-inch hose thread end, integral vacuum breaker, inlets 8 inches o.c., and two-handle mixing.
d. Faucet:

1) Standards:

a) ASME A112.18.1/CSA B125.1.
b) NSF 61 and NSF 372.
c) ICC A117.1.
d) ASSE 1001 (VB).

2) Finish: Polished chrome plated.
3) Handles: Lever.
4) Cartridges: Ceramic.
5) Brace: Adjustable top brace.

e. Vacuum Breaker: Required for hose outlet.
f. Spout Outlet: Hose thread in accordance with ASME B1.20.7.

B. Mop Sink Supply Fittings:

1. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.
2. Standard: ASME A112.18.1/CSA B125.1.
3. Supply Piping: Chrome-plated brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated brass or stainless steel wall flange.
4. Supply Stops: Chrome-plated brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
5. Operation: Loose key.
6. Risers:

a. NPS 1/2.
b. ASME A112.18.6/CSA B125.6, braided or corrugated stainless steel flexible hose.

C. Mop Sink Waste Fittings:

1. Standard: ASME A112.18.2/CSA B125.2.
2. Drain: Grid type with NPS 3 straight tailpiece.
3. Trap:

a. Size: NPS 3.
b. Material:

1) Chrome-plated, two-piece, cast-brass trap and swivel elbow with 17-gauge brass tube to wall and chrome-plated brass or steel wall flange.

D. Grout:

1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
2. Characteristics: Nonshrink; recommended for interior and exterior applications.
3. Design Mix: 5000 psi, 28-day compressive strength.
4. Packaging: Premixed and factory packaged.

2.4 COMMERCIAL URINALS

A. Urinals, Wall Hung:

1. Urinals, Wall Hung - Back Outlet, washout, standard or accessible:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1) American Standard
   2) Kohler Co.
   3) TOTO USA, Inc

b. Fixture:

   1) Standards:

      a) ASME A112.19.2/CSA B45.1.
      b) ASME A112.19.5/CSA B45.15.

   2) Material: Vitreous china.
   3) Type: Washout with extended shields.
   4) Strainer or Trapway: Manufacturer's standard strainer with integral trap.
   5) Water Consumption: 0.125 gpf.
   6) Spud Size and Location: NPS 3/4; top.
   7) Outlet Size and Location: NPS 2; back.
   8) Color: White.

c. Waste Fitting:

   1) Standard: ASME A112.18.2/CSA B125.2 for coupling.
   2) Size: NPS 2.

d. Support: Urinal carrier, floor affixed with steel uprights with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture.

e. Urinal Mounting Height: Standard or Accessible in accordance with ICC A117.1.

2.5 COMMERCIAL WATER CLOSETS

A. Water Closets, Wall Mounted:

1. Water Closets, Wall Mounted - Top Spud:

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) American Standard
      2) Kohler Co.
      3) TOTO USA, Inc.
   b. Source Limitations: Obtain water closets from single source from single manufacturer.
   c. Standard: ASME A112.19.2/CSA B45.1.
   d. Bowl:

      1) Material: Vitreous china.
      2) Type: Siphon jet.
      3) Style: Flushometer valve.
      4) Mounting Height: Standard or Accessible in accordance with ICC A117.1.
      5) Rim Contour: Elongated.
      6) Water Consumption: Dual flush 1.1 gal./1.6 gal. per flush.
      7) Spud Size and Location: NPS 1-1/2; top.
      8) Color: White.
   e. Support: Water-closet carrier, floor affixed.

2.6 FLUSHOMETER VALVES

A. Water Closet Flushometer Valves, Manually Operated:

1. Flushometer Valves, Manually Operated - Diaphragm, Lever Handle:

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Sloan Valves
      2) Zurn Industries, LLC
      3) Delany Products
   b. Source Limitations: Obtain flushometer valve from single source from single manufacturer.
   c. Standard: ASSE 1037/ASME 112.1037/CSA B125.37.
   d. Minimum Pressure Rating: 125 psig.
   e. Features: Include integral check stop and backflow-prevention device.
   f. Material: Brass body with corrosion-resistant components.
   g. Style: Exposed.
   h. Flushometer-Valve Finish: Chrome-plated.
   i. Handle Finish: Antimicrobial.
   j. Consumption: Dual flush 1.1 gal./1.6 gal. per flush.
   k. Minimum Inlet: NPS 1.
   l. Minimum Outlet: NPS 1-1/4.

B. Urinal Flushometer Valves, Sensor Operated:

1. Flushometer Valves, Sensor Operated - Diaphragm:

   a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1) Sloan Valve Company
      2) Zurn Industries, LLC
      3) TOTO USA, Inc
   b. Source Limitations: Obtain flushometer valve from single source from single manufacturer.
   c. Standard: ASSE 1037/ASME 112.1037/CSA B125.37.
   d. Minimum Pressure Rating: 125 psig.
   e. Features: Include integral check stop and backflow-prevention device.
   f. Material: Brass body with corrosion-resistant components.
   g. Style: Exposed.

   h. Exposed Flushometer-Valve Finish: Chrome-plated.
   i. Actuator: Side or top mounted; listed and labeled as defined in NFPA 70, by qualified testing agency, and marked for intended location and application.
   j. Trip Mechanism: Battery-powered electronic sensor; listed and labeled as defined in NFPA 70, by qualified testing agency, and marked for intended location and application.
   k. Consumption: 0.125 gal. per flush.
   l. Minimum Inlet: NPS 3/4.
   m. Minimum Outlet: NPS 3/4.

2.7 WATER CLOSET SEATS

A. Toilet Seats

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Beneke
   b. Bemis Manufacturer
   c. Kohler Co.
2. Source Limitations: Obtain toilet seat from single source from single manufacturer.
3. Standard: IAPMO/ANSI Z124.5.
4. Material: Plastic.
5. Type: Commercial (Heavy duty).
6. Shape: Elongated rim, open front.
7. Hinge: Check.
8. Hinge Material: Noncorroding metal.
9. Seat Cover: Not required.
10. Color: White.
11. Surface Treatment: Not required.

2.8 FIXTURE CARRIERS

A. Fixture Carriers - Urinal:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Zurn Industries, LLC
      b. Smith Industries
      c. Josam Industries
   2. Source Limitations: Obtain urinal carriers from single source from single manufacturer.
   3. Standard: ASME A112.6.1M.
   4. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings, gaskets, and feet; bolts and hardware matching fixture.

B. Fixture Carriers - Water Closet:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Zurn Industries, LLC
      b. Smith Industries
      c. Josam Company
   2. Source Limitations: Obtain water closet carriers from single source from single manufacturer.
   3. Standard: ASME A112.6.1M.
   4. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings, gaskets, and feet; bolts and hardware matching fixture.

PART 3 - EXECUTION

3.1 INSTALLATION OF COMMERCIAL PLUMBING FIXTURES

A. Lavatory Installation:
   1. Install water-supply piping with stop on each supply to each lavatory faucet. Install stops in locations that are accessible for ease of operation.
   2. Install trap and waste piping on each drain outlet of each lavatory to be connected to sanitary drainage system.
   3. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."
   4. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
   5. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

B. Mop Sink Installation:

1. Install sinks level and plumb in accordance with roughing-in drawings.
2. Install supports, affixed to building substrate, for wall-mounted sinks.
3. Set floor-mounted sinks in leveling bed of cement grout.
4. Install water-supply piping with stop on each supply to each sink faucet.

    a. Exception: Use ball or gate valves if supply stops are not specified with sink. Comply with valve requirements specified in Section 220523 "General Duty Valves for Plumbing Piping."
    b. Install stops/valves in locations that are accessible for ease of operation.

5. Install trap and waste piping on each drain outlet of each sink to be connected to sanitary drainage system.
6. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."
7. Seal joints between sinks, counters, floors, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."
8. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible sinks. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

C. Urinal Installation:

1. Install urinals level and plumb in accordance with roughing-in drawings.
2. Install wall-hung, back-outlet urinals onto waste-fitting seals and attached to supports.
3. Install wall-hung, bottom-outlet urinals with tubular waste piping attached to supports.
4. Install accessible, wall-mounted urinals at mounting height in accordance with ICC A117.1.
5. Install trap-seal liquid in waterless urinals.
6. Install supports, affixed to building substrate, for wall-hung urinals.
7. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
8. Use carriers without waste fitting for urinals with tubular waste piping.
9. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.
10. Measure support height installation from finished floor, not structural floor.
11. Install flushometer-valve, water-supply fitting on each supply to each urinal.
12. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
13. Install actuators in locations easily reachable for people with disabilities.
14. Install new batteries in battery-powered, electronic-sensor mechanisms.
15. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Install deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."

16. Seal joints between urinals, walls, and floors using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to urinal color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

D. Water Closet Installation:

1. Install water closets level and plumb in accordance with roughing-in drawings.
2. Install accessible, wall-mounted water closets at mounting height in accordance with ICC A117.1.
3. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
4. Use carrier supports with waste-fitting assembly and seal.
5. Install floor-mounted, back-outlet water closets, attached to building floor substrate, onto waste-fitting seals; and attach to support.
6. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals, and affix to building substrate.
7. Measure support height installation from finished floor, not structural floor.
8. Install flushometer-valve, water-supply fitting on each supply to each water closet.
9. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
10. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
11. Install actuators in locations easily reachable for people with disabilities.
12. Install toilet seats on water closets.
13. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Install deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."
14. Seal joints between water closets, walls, and floors using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to water-closet color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.2 INSTALLATION OF PIPING CONNECTIONS

A. Connect plumbing fixtures with water supplies and soil, waste, and vent piping. Use size fittings required to match plumbing fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil, waste, and vent piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Install protective-shielding pipe covers and enclosures on exposed supplies and waste piping of accessible plumbing fixtures. Comply with requirements in Section 220719 "Plumbing Piping Insulation."

E. Where installing piping adjacent to water closets and urinals, allow space for service and maintenance.

3.3 CLEANING AND PROTECTION

A. After completing installation of plumbing fixtures, inspect and repair damages finishes. Replace any fixtures unable to be repaired to the satisfaction of the Owner.

B. Clean plumbing fixtures and associated faucets, valves, flushometer valves, and fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed plumbing fixtures and associated faucets, valves, flushometer valves, and fittings.

D. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224200

SECTION 224700 - DRINKING FOUNTAINS AND WATER COOLERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Water coolers.
   2. Bottle filling stations.
   3. Fixture carriers.

1.2 ACTION SUBMITTALS

A. Product data.

B. Shop Drawings:

   1. Plans, elevations, sections, and mounting details.
   2. Details of fixture assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   3. Diagrams for power wiring.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

   1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include servicing and adjustment of electronic-sensor fixtures.

1.4 WARRANTY

A. Manufacturer Warranty: Manufacturer and Installer agree to repair or replace drinking fountains and bottle filling stations that fail in materials or workmanship within specified warranty period.

B. Warranty Period: One year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Standards:

1. Drinking fountains, water coolers, bottle filling stations, and remote water coolers intended to convey or dispense water for human consumption are to comply with the U.S. Safe Drinking Water Act (SDWA), requirements of the authority having jurisdiction, and with NSF 61 or NSF 372, or be certified in compliance with NSF 61 or NSF 372 by an ANSI-accredited third-party certification body, that the weighted average lead content at wetted surfaces is less than or equal to 0.25 percent.

2.2 ELECTRIC WATER COOLER

A. ELECTRIC WATER COOLER, Wall Mounted:(ECB-1)

1. Elkay EZSTLDDWSLK, Oasis International PV8ACSL/VersaFiller, or Murdock Manufacturing A172400S-BF4-BDC.
2. Source Limitations: Obtain, wall-mounted, drinking fountains from single source from single manufacturer.
3. Standards:

   a. NSF 61.
   b. NSF 372.
   c. ASME A112.19.3/CSA B45.4.

4. Receptor Shape: Concave with projecting bowl.
5. Bubbler: two, with adjustable stream regulator, located on deck.
6. Maximum Water Flow: 0.5 gpm.
7. Control: Push button.
8. Drain: Grid type with NPS 1-1/2 tailpiece.
9. Supply: NPS 3/8 with shutoff valve.
10. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/2 brass P-trap.
11. Filter: One or more water filters with capacity sized for unit peak flow rate.

    a. Standards:

       1) NSF 42.
       2) NSF 53.

12. Support: Manufacturer-provided support frame for attaching to substrate.
13. Drinking Fountain Mounting Height: Accessible in accordance with ICC A117.1.
14. Bottle Filler: One, with activation sensor.

2.3 FIXTURE CARRIERS

A. Fixture Carriers:

1. Elkay MLP2000, Oasis 031355-001, or Murdock A0000000-CSC3.
2. Standard: ASME A112.6.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.

B. Examine walls and floors for suitable conditions where fixtures will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install fixtures level and plumb in accordance with roughing-in drawings. For fixtures indicated for juveniles, install at height required by authorities having jurisdiction.

B. Install drinking fountains and bottle filling stations secured to wood blocking in wall construction.

C. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.

D. Install mounting frames, affixed to building construction, and attach recessed water coolers and bottle filling stations to mounting frames.

E. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 220523 "General-Duty Valves for Plumbing Piping."

F. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.

G. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220500 "Common Work Results for Plumbing."

H. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

3.3 PIPING CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Install ball shutoff valve on water supply to each fixture. Install valve upstream from filter for drinking fountain, and bottle filling station. Comply with valve requirements specified in Section 220523 "General-Duty Valves for Plumbing Piping."

D. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

3.4 ELECTRICAL CONNECTIONS

A. Connect wiring in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

C. Install electrical devices furnished by manufacturer, but not factory mounted, in accordance with NFPA 70 and NECA 1.

D. Install nameplate for each electrical connection, indicating electrical equipment designation and circuit number feeding connection.

1. Nameplates to be laminated acrylic or melamine plastic signs, as specified in Section 260553 "Identification for Electrical Systems."

3.5 ADJUSTING

A. Adjust fixture flow regulators for proper flow and stream height.

B. Adjust electronic-sensor settings.

3.6 CLEANING

A. After installing fixtures, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.

B. Clean fixtures, on completion of installation, in accordance with manufacturer's written instructions.

C. Provide protective covering for installed fixtures.

D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 224700

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SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Piping materials and installation instructions common to most piping systems.
2. Transition fittings.
3. Dielectric fittings.
4. Mechanical sleeve seals.
5. Sleeves.
6. Escutcheons.
7. Grout.
8. HVAC demolition.
9. Equipment installation requirements common to equipment sections.
10. Painting and finishing.
11. Concrete bases.
12. Supports and anchorages.

1.3 DEFINITIONS

A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.

B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.

C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.

D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.

E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

F. The following are industry abbreviations for plastic materials:

1. CPVC: Chlorinated polyvinyl chloride plastic.
2. PE: Polyethylene plastic.
3. PVC: Polyvinyl chloride plastic.

G. The following are industry abbreviations for rubber materials:

1. EPDM: Ethylene-propylene-diene terpolymer rubber.
2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

A. Product Data: For the following:

1. Transition fittings.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Escutcheons.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."

B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

C. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.

B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.

B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.

C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 PIPE, TUBE, AND FITTINGS

A. Refer to individual Division 23 piping Sections for pipe, tube, and fitting materials and joining methods.

B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

A. Refer to individual Division 23 piping Sections for special joining materials not listed below.

B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

2. AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.

C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

D. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.

E. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

F. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing, unless otherwise indicated; and AWS A5.8, BAg1, silver alloy for refrigerant piping, unless otherwise indicated.

G. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

H. Solvent Cements for Joining Plastic Piping:

1. CPVC Piping: ASTM F 493.
2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

I. Fiberglass Pipe Adhesive: As furnished or recommended by pipe manufacturer.

2.4 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Fittings: CPVC and PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Manufacturers:
   a. Apollo
   b. Eslon Thermoplastics.
   c. Spears Manufacturing

B. Plastic-to-Metal Transition Adaptors: One-piece fitting with manufacturer's SDR 11 equivalent dimensions; one end with threaded brass insert, and one solvent-cement-joint end.

1. Manufacturers:
   a. Matco-Norca
   b. Spears Manufacturing
   c. Thompson Plastics, Inc.

C. Plastic-to-Metal Transition Unions: MSS SP-107, CPVC and PVC four-part union. Include brass end, solvent-cement-joint end, rubber O-ring, and union nut.

1. Manufacturers:
   a. Apollo
   b. NIBCO, Inc.; Chemtrol Div.
   c. Spears Manufacturing

2.5 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).

1. Manufacturers:
   a. Capitol Manufacturing Co.
   b. Central Plastics Company.
   c. Eclipse, Inc.
   d. Epco Sales, Inc.
   e. Hart Industries, International, Inc.
   f. Watts Industries, Inc.; Water Products Div.
   g. Zurn Industries, Inc.; Wilkins Div.

D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure as required to suit system pressures.

1. Manufacturers:
   a. Capitol Manufacturing Co.
   b. Central Plastics Company.
   c. Epco Sales, Inc.
   d. Watts Industries, Inc.; Water Products Div.

E. Dielectric-Flange Kits: Companion-flange assembly for field assembly. Include flanges, full-face- or ring-type neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.

1. Manufacturers:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Central Plastics Company.
   d. Pipeline Seal and Insulator, Inc.

2. Separate companion flanges and steel bolts and nuts shall have 150- or 300-psig (1035- or 2070-kPa) minimum working pressure where required to suit system pressures.

F. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

1. Manufacturers:
   a. Calpico, Inc.
   b. Lochinvar Corp.
   c. Legend

G. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

1. Manufacturers:
   a. Perfection Corp.
   b. Precision Plumbing Products, Inc.
   c. Sioux Chief Manufacturing Co., Inc.
   d. Victaulic Co. of America.

2.6 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.

1. Manufacturers:
   a. Advance Products & Systems, Inc.
   b. Calpico, Inc.
   c. Metraflex Co.
   d. Pipeline Seal and Insulator, Inc.

2. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
3. Pressure Plates: Stainless steel. Include two for each sealing element.
4. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.7 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.

C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with set screws.

E. Molded PVC: Permanent, with nailing flange for attaching to wooden forms.

F. PVC Pipe: ASTM D 1785, Schedule 40.

G. Molded PE: Reusable, PE, tapered-cup shaped, and smooth-outer surface with nailing flange for attaching to wooden forms.

2.8 GROUT

A. Description: ASTM C 1107, Grade B, nonshrink and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 HVAC DEMOLITION

A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.

B. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.

1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.

C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Verify final equipment locations for roughing-in.

M. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
4. PVC Nonpressure Piping: Join according to ASTM D 2855.

J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.

K. Plastic Nonpressure Piping Gasketed Joints: Join according to ASTM D 3212.

L. PE Piping Heat-Fusion Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join according to ASTM D 2657.

1. Plain-End Pipe and Fittings: Use butt fusion.
2. Plain-End Pipe and Socket Fittings: Use socket fusion.

M. Fiberglass Bonded Joints: Prepare pipe ends and fittings, apply adhesive, and join according to pipe manufacturer's written instructions.

3.4 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.

C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.

D. Install equipment to allow right of way for piping installed at required slope.

3.6 PAINTING

A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" a

B. nd "Exterior Painting."

C. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi (20.7-MPa) 28-day compressive-strength concrete and reinforcement as specified in Division 03 Section "Cast-in-Place Concrete."

3.8 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 05 Section "Metal Fabrications" for structural steel.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.

C. Field Welding: Comply with AWS D1.1.

3.9 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor HVAC materials and equipment.

B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.

C. Attach to substrates as required to support applied loads.

3.10 GROUTING

A. Mix and install grout for HVAC equipment base bearing surfaces, pump and other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

END OF SECTION 23 05 00

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SECTION 23 05 16 - EXPANSION FITTINGS AND LOOPS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Expansion-compensator packless expansion joints.
2. Flexible-hose packless expansion joints.
3. Pipe loops and swing connections.
4. Alignment guides and anchors.

1.3 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Delegated-Design Submittal: For each anchor and alignment guide indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
3. Alignment Guide Details: Detail field assembly and attachment to building structure.
4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

C. Welding certificates.

D. Product Certificates: For each type of expansion joint, from manufacturer.

E. Maintenance Data: For expansion joints to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. ASME Boiler and Pressure Vessel Code: Section IX.

PART 2 - PRODUCTS

2.1 PACKLESS EXPANSION JOINTS

A. Flexible-Hose Packless Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Flex-Hose Co., Inc.
   b. Flexicraft Industries.
   c. Flex Pression Ltd.
   d. Metraflex, Inc.
   e. Unisource Manufacturing, Inc.
2. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
3. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
4. Expansion Joints for Copper Tubing NPS 2 (DN 50) and Smaller: Copper-alloy fittings with solder-joint end connections.
   a. Bronze hoses and single-braid bronze sheaths with 450 psig at 70 deg F (3100 kPa at 21 deg C) and 340 psig at 450 deg F (2340 kPa at 232 deg C) ratings.
5. Expansion Joints for Copper Tubing NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Copper-alloy fittings with threaded end connections.
   a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 300 psig at 70 deg F (2070 kPa at 21 deg C) and 225 psig at 450 deg F (1550 kPa at 232 deg C) ratings.
6. Expansion Joints for Steel Piping NPS 2 (DN 50) and Smaller: Carbon-steel fittings with threaded end connections.
   a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 450 psig at 70 deg F (3100 kPa at 21 deg C) and 325 psig at 600 deg F (2250 kPa at 315 deg C) ratings.
7. Expansion Joints for Steel Piping NPS 2-1/2 to NPS 6 (DN 65 to DN 150): Carbon-steel fittings with flanged end connections.
   a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 200 psig at 70 deg F (1380 kPa at 21 deg C) and 145 psig at 600 deg F (1000 kPa at 315 deg C) ratings.
8. Expansion Joints for Steel Piping NPS 8 to NPS 12 (DN 200 to DN 300): Carbon-steel fittings with flanged end connections.

a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 125 psig at 70 deg F (860 kPa at 21 deg C) and 90 psig at 600 deg F (625 kPa at 315 deg C) ratings.

9. Expansion Joints for Steel Piping NPS 14 (DN 350) and Larger: Carbon-steel fittings with flanged end connections.
   a. Stainless-steel hoses and double-braid, stainless-steel sheaths with 165 psig at 70 deg F (1130 kPa at 21 deg C) and 120 psig at 600 deg F (830 kPa at 315 deg C) ratings.

2.2 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Adsco Manufacturing LLC.
   b. Advanced Thermal Systems, Inc.
   c. Flex-Hose Co., Inc.
   d. Flexicraft Industries.
   e. Flex-Weld, Inc.
   f. Hyspan Precision Products, Inc.
   g. Metraflex, Inc.
   h. Senior Flexonics Pathway.
   i. Unisource Manufacturing, Inc.
   j. U.S. Bellows, Inc.

2. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding spider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36/A 36M.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.

   a. Stud: Threaded, zinc-coated carbon steel.
   b. Expansion Plug: Zinc-coated steel.
   c. Washer and Nut: Zinc-coated steel.

5. Chemical Fasteners: Insert-type-stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.

   a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
   b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud unless otherwise indicated.

c. Washer and Nut: Zinc-coated steel.

PART 3 - EXECUTION

3.1 EXPANSION-JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Install packed-type expansion joints with packing suitable for fluid service.

C. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."

D. Install rubber packless expansion joints according to FSA-NMEJ-702.

E. Install grooved-joint expansion joints to grooved-end steel piping

3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION

A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.

B. Connect risers and branch connections to mains with at least five pipe fittings including tee in main.

C. Connect risers and branch connections to terminal units with at least four pipe fittings including tee in riser.

D. Connect mains and branch connections to terminal units with at least four pipe fittings including tee in main.

3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install two guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.

C. Attach guides to pipe and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:

1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24, U-bolts bolted to anchor.

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.

1. Anchor Attachment to Steel Structural Members: Attach by welding.
2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 23 05 16

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SECTION 23 05 17 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Sleeves.
2. Stack-sleeve fittings.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 SLEEVES

A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.

C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.

D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.

E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.

F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

G. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.2 STACK-SLEEVE FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Smith, Jay R. Mfg. Co.
2. Zurn Specification Drainage Operation; Zurn Plumbing Products Group.

B. Description: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring, bolts, and nuts for membrane flashing.

1. Underdeck Clamp: Clamping ring with setscrews.

2.3 SLEEVE-SEAL SYSTEMS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Advance Products & Systems, Inc.
2. CALPICO, Inc.
3. Metraflex Company (The).
4. Pipeline Seal and Insulator, Inc.
5. Proco Products, Inc.

B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.4 SLEEVE-SEAL FITTINGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Presealed Systems.

B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

2.5 GROUT

A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Nonshrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch (25-mm) annular clear space between piping and concrete slabs and walls.

1. Sleeves are not required for core-drilled holes.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
2. Cut sleeves to length for mounting flush with both surfaces.
   a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level.
3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Division 07 Section "Joint Sealants."

E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."

3.2 STACK-SLEEVE-FITTING INSTALLATION

A. Install stack-sleeve fittings in new slabs as slabs are constructed.

1. Install fittings that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
2. Secure flashing between clamping flanges for pipes penetrating floors with membrane waterproofing. Comply with requirements for flashing specified in Division 07 Section "Sheet Metal Flashing and Trim."
3. Install section of cast-iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level.

4. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
5. Using grout, seal the space around outside of stack-sleeve fittings.

B. Fire-Barrier Penetrations: Maintain indicated fire rating of floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements for firestopping specified in Division 07 Section "Penetration Firestopping."

3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

3.4 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

3.5 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:
   a. Piping Smaller Than NPS 6 (DN 150): Cast-iron wall sleeves.
   b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-pipe sleeves.
2. Exterior Concrete Walls below Grade:
   a. Piping Smaller Than NPS 6 (DN 150): Cast-iron wall sleeves with sleeve-seal system.
      1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
   b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.
      1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
3. Concrete Slabs-on-Grade:
   a. Piping Smaller Than NPS 6 (DN 150): Cast-iron wall sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:
   a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.
   b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-pipe sleeves.
5. Interior Partitions:
   a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.
   b. Piping NPS 6 (DN 150) and Larger: Galvanized-steel-sheet sleeves

END OF SECTION 23 05 17

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SECTION 23 05 18 - ESCUTCHEONS FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 ESCUTCHEONS

A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With chrome-plated finish and screw fasteners.

D. Split-Casting Brass Type: With polished, chrome-plated finish and with concealed hinge and setscrew.

E. Split-Plate, Stamped-Steel Type: With chrome-plated finish, concealed hinge, and spring-clip fasteners.

2.2 FLOOR PLATES

A. One-Piece Floor Plates: Cast-iron flange .

B. Split-Casting Floor Plates: Cast brass with concealed hinge.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons:
    a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
    c. Insulated Piping: One-piece, stamped-steel type with spring cups..
    d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
    e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
    f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass or split-casting brass type with polished, chrome-plated finish.
    g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, stamped-steel type or split-plate, stamped-steel type with concealed hinge and set screw.
    h. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type.
    i. Bare Piping in Unfinished Service Spaces: One-piece, stamped-steel type with concealed or exposed-rivet hinge and set screw.
    j. Bare Piping in Equipment Rooms: One-piece, cast-brass type.
    k. Bare Piping in Equipment Rooms: One-piece, stamped-steel type with set screw.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

    1. New Piping: One-piece, floor-plate type.

E. Install floor plates for piping penetrations of equipment-room floors.

F. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

    1. New Piping: One-piece, floor-plate type.
    2. Existing Piping: Split-casting, floor-plate type.

3.2 FIELD QUALITY CONTROL

A. Replace broken and damaged escutcheons and floor plates using new materials.

END OF SECTION 23 05 18

SECTION 23 05 19 - METERS AND GAGES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Thermowells.
3. Dial-type pressure gages.
4. Gage attachments.
5. Test plugs.
6. Test-plug kits.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Wiring Diagrams: For power, signal, and control wiring.

C. Product Certificates: For each type of meter and gage, from manufacturer.

D. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Marsh Bellofram.
2. Tel-Tru Manufacturing Company.
3. Trerice, H. O. Co.
4. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
5. Weiss Instruments, Inc.

B. Standard: ASME B40.200.

C. Case: Liquid-filled and sealed type(s); Type 304 stainless steel with the following nominal diameter:

1. Installation in piping: 3 inch diameter.
2. Installations in tanks and similar equipment: 5 inch diameter.
3. Installation in air-side systems: 5 inch diameter.

D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F (deg C).

E. Connector Type(s): Union joint, adjustable angle rigid, back and rigid, bottom, with unified-inch screw threads.

F. Connector Size: 1/2 inch (13 mm), with ASME B1.1 screw threads.

G. Stem: 0.25 or 0.375 inch (6.4 or 9.4 mm) in diameter; stainless steel.

H. Window: Plain glass or plastic

I. Ring: Stainless steel.

J. Element: Bimetal coil.

K. Pointer: Dark-colored metal.

L. Accuracy: Plus or minus 1 percent of scale range.

2.2 DUCT-THERMOMETER MOUNTING BRACKETS

A. Description: Flanged bracket with screw holes, for attachment to air duct and made to hold thermometer stem.

2.3 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, (DN 15, DN 20, or NPS 25,) ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch (13, 19, and 25 mm), with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Ashcroft Inc.
   b. Marsh Bellofram.
   c. Trerice, H. O. Co.
   d. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
   e. Weiss Instruments, Inc.
   f. WIKA Instrument Corporation - USA.
2. Standard: ASME B40.100.
3. Case: Liquid-filled type(s); stainless steel or cast aluminum ; 4-1/2-inch (114-mm) nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).
8. Pointer: Dark-colored metal.
9. Window: Glass or plastic.
10. Ring: Stainless steel.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.5 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and porous-metal-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass or stainless-steel needle, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15)], ASME B1.20.1 pipe threads.

2.6 TEST PLUGS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Peterson Equipment Co., Inc.
2. Trerice, H. O. Co.
3. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
4. Weiss Instruments, Inc.

B. Description: Test-station fitting made for insertion into piping tee fitting.

C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.

D. Thread Size: NPS 1/4 (DN 8) or NPS 1/2 (DN 15), ASME B1.20.1 pipe thread.

E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F (3450 kPa at 93 deg C)

F. Core Inserts: Neoprene self-sealing rubber.

2.7 TEST-PLUG KITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Peterson Equipment Co., Inc.
2. Trerice, H. O. Co.
3. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
4. Weiss Instruments, Inc.

B. Furnish two test-plug kit(s) containing two thermometer(s), one pressure gage and adapter, and carrying case. Thermometer sensing elements, pressure gage, and adapter probes shall be of diameter to fit test plugs and of length to project into piping.

C. Low-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- (25- to 51-mm-) diameter dial and tapered-end sensing element. Dial range shall be at least 25 to 125 deg F (minus 4 to plus 52 deg C).

D. High-Range Thermometer: Small, bimetallic insertion type with 1- to 2-inch- (25- to 51-mm-) diameter dial and tapered-end sensing element. Dial range shall be at least 0 to 220 deg F (minus 18 to plus 104 deg C).

E. Pressure Gage: Small, Bourdon-tube insertion type with 2- to 3-inch- (51- to 76-mm-) diameter dial and probe. Dial range shall be at least 0 to 200 psig (0 to 1380 kPa).

F. Carrying Case: Metal or plastic, with formed instrument padding.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending a minimum of one-third of pipe diameter and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

E. Install duct-thermometer mounting brackets in walls of ducts. Attach to duct with screws.

F. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

G. Install valve and snubber in piping for each pressure gage for fluids (except steam).

H. Install test plugs in piping tees.

I. Install thermometers in the following locations:

1. Inlet and outlet of each hydronic zone.
2. Inlet and outlet of each hydronic boiler.
3. Two inlets and two outlets of each chiller.
4. Inlet and outlet of each hydronic coil in air-handling units.
5. Two inlets and two outlets of each hydronic heat exchanger.
6. Inlet and outlet of each thermal-storage tank.
7. Outside-, return-, supply-, and mixed-air ducts.

J. Install pressure gages in the following locations:

1. Discharge of each pressure-reducing valve.
2. Inlet and outlet of each chiller chilled-water and condenser-water connection.
3. Suction and discharge of each pump.

3.2 CONNECTIONS

A. Install thermometers and gages adjacent to machines and equipment to allow service and maintenance of thermometers, gages, machines, and equipment.

3.3 ADJUSTING

A. After installation, calibrate meters according to manufacturer's written instructions.

B. Adjust faces of meters and gages to proper angle for best visibility.

3.4 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each hydronic zone shall be the following:

1. Test plug with neoprene self-sealing rubber inserts.

B. Thermometers at inlets and outlets of each water-to-water heat pump shall be the following:

1. Liquid-filled, bimetallic-actuated type.

C. Thermometers at inlet and outlet of each hydronic coil in air-handling units and built-up central systems shall be the following:

1. Liquid-filled, bimetallic-actuated type.

D. Thermometers at inlet and outlet of each hydronic coil in terminal units shall be the following:

1. Test plug with neoprene self-sealing rubber inserts.

E. Thermometers at outside-, return-, and supply-air ducts shall be the following:

1. Liquid-filled, bimetallic-actuated type.

F. Thermometer stems shall be of length to match thermowell insertion length.

3.5 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Chilled-Water Piping: 0 to 100 deg F (Minus 20 to plus 50 deg C).

B. Scale Range for Ground Source-Water Piping: 0 to 100 deg F (Minus 20 to plus 50 deg C).

C. Scale Range for Heating, Hot-Water Piping: 20 to 240 deg F (0 to 150 deg C).

D. Scale Range for Air Ducts: Minus 40 to plus 160 deg F (Minus 40 to plus 100 deg C).

3.6 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each pressure-reducing valve shall be the following:

1. Liquid-filled, direct-mounted, metal case.

B. Pressure gages at inlet and outlet of each water-to-water heat pump connection shall be the following:

1. Liquid-filled, direct-mounted, metal case.

C. Pressure gages at suction and discharge of each pump shall be the following:

1. Liquid-filled, direct-mounted, metal case.

3.7 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Chilled-Water Piping: Scale Range for Chilled-Water Piping: 0 to 200 psi (0 to 1400 kPa).

B. Scale Range for Ground Source Water Piping: 0 to 200 psi (0 to 1400 kPa).

C. Scale Range for Heating, Hot-Water Piping: Scale Range for Chilled-Water Piping: 0 to 200 psi (0 to 1400 kPa).

END OF SECTION 23 05 19

SECTION 23 05 23 - GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. Iron ball valves.
4. Iron, single-flange butterfly valves.
5. Bronze swing check valves.
6. Iron swing check valves.
7. Chainwheels.

B. Related Sections:

1. Division 23 HVAC piping Sections for specialty valves applicable to those Sections only.
2. Division 23 Section "Identification for HVAC Piping and Equipment" for valve tags and schedules.

1.3 DEFINITIONS

A. CWP: Cold working pressure.

B. EPDM: Ethylene propylene copolymer rubber.

C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.

D. NRS: Nonrising stem.

E. OS&Y: Outside screw and yoke.

F. RS: Rising stem.

G. SWP: Steam working pressure.

1.4 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.5 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Prepare valves for shipping as follows:

1. Protect internal parts against rust and corrosion.
2. Protect threads, flange faces, grooves, and weld ends.
3. Set angle valves closed to prevent rattling.
4. Set ball and plug valves open to minimize exposure of functional surfaces.
5. Set butterfly valves closed or slightly open.
6. Block check valves in either closed or open position.

B. Use the following precautions during storage:

1. Maintain valve end protection.
2. Store valves indoors and maintain at higher than ambient dew point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.

C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Handwheel: For valves other than quarter-turn types.
2. Handlever: For quarter-turn valves NPS 6 (DN 150) and smaller except plug valves.
3. Wrench: For plug valves with square heads. Furnish Owner with 1 wrench for every 5 plug valves, for each size square plug-valve head.
4. Chainwheel: Device for attachment to valve handwheel, stem, or other actuator; of size and with chain for mounting height, as indicated in the "Valve Installation" Article.

E. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:
1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
2. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Grooved: With grooves according to AWWA C606.
3. Solder Joint: With sockets according to ASME B16.18.
4. Threaded: With threads according to ASME B1.20.1.

G. Valve Bypass and Drain Connections: MSS SP-45.

2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
   a. Jomar International, LTD.
   b. Legend Valve.
   c. NIBCO INC.
2. Description:
   a. Standard: MSS SP-110.
   b. SWP Rating: 150 psig (1035 kPa).
   c. CWP Rating: 600 psig (4140 kPa).
   d. Body Design: Two piece.
   e. Body Material: Forged brass.
   f. Ends: Threaded.
   g. Seats: PTFE or TFE.
   h. Stem: Brass.
   i. Ball: Chrome-plated brass.
   j. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following

a. American Valve, Inc.
b. NIBCO INC.
c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:
a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

2.4 IRON BALL VALVES

A. Class 125, Iron Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. American Valve, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:
a. Standard: MSS SP-72.
b. CWP Rating: 200 psig (1380 kPa).
c. Body Design: Split body.
d. Body Material: ASTM A 126, gray iron.
e. Ends: Flanged.
f. Seats: PTFE or TFE.
g. Stem: Stainless steel.
h. Ball: Stainless steel.
i. Port: Full.

2.5 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 150 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Stainless-Steel Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following
a. Conbraco Industries, Inc.; Apollo Valves.
b. NIBCO INC.
c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:
a. Standard: MSS SP-67, Type I.
b. CWP Rating: 150 psig (1035 kPa).
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.

d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Stainless steel.

2.6 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Valve, Inc.
   b. NIBCO INC.
   c. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
   a. Standard: MSS SP-80, Type 3.
   b. CWP Rating: 200 psig (1380 kPa).
   c. Body Design: Horizontal flow.
   d. Body Material: ASTM B 62, bronze.
   e. Ends: Threaded.
   f. Disc: Bronze.

2.7 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Kitz Corporation.
   b. Legend Valve.
   c. NIBCO INC.
   d. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
2. Description:
   a. Standard: MSS SP-71, Type I.
   b. NPS 2-1/2 to NPS 12 (DN 65 to DN 300), CWP Rating: 200 psig (1380 kPa).
   c. Body Design: Clear or full waterway.
   d. Body Material: ASTM A 126, gray iron with bolted bonnet.
   e. Ends: Flanged.
   f. Trim: Bronze.
   g. Gasket: Asbestos free.

2.8 CHAINWHEELS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Babbitt Steam Specialty Co.
2. Roto Hammer Industries.

3. Trumbull Industries.

B. Description: Valve actuation assembly with sprocket rim, brackets, and chain.

1. Brackets: Type, number, size, and fasteners required to mount actuator on valve.
2. Attachment: For connection to ball and butterfly valve stems.
3. Sprocket Rim with Chain Guides: Ductile or cast iron , of type and size required for valve.
4. Chain: Hot-dip, galvanized steel, of size required to fit sprocket rim.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install chainwheels on operators for ball and butterfly valves NPS 4 (DN 100) and larger and more than 96 inches (2400 mm) above floor. Extend chains to above finished floor.

F. Install check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball or butterfly valves.
2. Butterfly Valve Dead-End Service: Single-flange (lug) type.
3. Throttling Service except Steam: Butterfly valves.
4. Pump-Discharge Check Valves:
   a. NPS 2-1/2 (DN 65) and Larger: Iron swing check valves with lever and weight or with spring or iron, center-guided, metal or resilient-seat check valves.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Steel Piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Steel Piping, NPS 5 (DN 125) and Larger: Flanged ends.

3.5 CHILLED-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, brass or bronze with brasstrim.
3. Bronze Swing Check Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): May be provided with threaded ends instead of flanged ends.
2. Iron Ball Valves, NPS 2-1/2 to NPS 10 (DN 65 to DN 250): Class 125.
3. Iron, Single-Flange Butterfly Valves, NPS 14 to NPS 24 (DN 350 to DN 600): 150 CWP, EPDM seat, aluminum-bronze.
4. Iron Swing Check Valves: Class 125 , metal seats.

3.6 HEATING-WATER VALVE SCHEDULE

A. Pipe NPS 2 (DN 50) and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, brass or bronze with brass trim.
3. Bronze Swing Check Valves: Class 125, bronze disc.

B. Pipe NPS 2-1/2 (DN 65) and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): May be provided with threaded ends instead of flanged ends.
2. Iron Ball Valves, NPS 2-1/2 to NPS 10 (DN 65 to DN 250): Class 125.
3. Iron, Single-Flange Butterfly Valves, NPS 14 to NPS 24 (DN 350 to DN 600): 150 CWP, EPDM seat, aluminum-bronze disc.
4. Iron Swing Check Valves: Class 125 , metal seats.

END OF SECTION 23 05 23

SECTION 23 05 29 - HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Pipe stands.
7. Equipment supports.

B. Related Sections:

1. Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.
2. Division 23 Section "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.
3. Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for vibration isolation devices.
4. Division 23 Section(s) “Metal Ducts” for duct hangers and supports.

1.3 DEFINITIONS

A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.4 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for HVAC piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Metal framing systems.
3. Pipe stands.
4. Equipment supports.

C. Welding certificates.

1.6 QUALITY ASSURANCE

A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 METAL FRAMING SYSTEMS

A. MFMA Manufacturer Metal Framing Systems:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Allied Tube & Conduit.
   b. Cooper B-Line, Inc.
   c. Flex-Strut Inc.
   d. GS Metals Corp.
   e. Thomas & Betts Corporation.
   f. Unistrut Corporation; Tyco International, Ltd.
   g. Wesanco, Inc.
2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Hot-dipped galvanized.

2.4 THERMAL-HANGER SHIELD INSERTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Carpenter & Paterson, Inc.
2. Clement Support Services.
3. ERICO International Corporation.
4. National Pipe Hanger Corporation.
5. PHS Industries, Inc.
6. Pipe Shields, Inc.; a subsidiary of Piping Technology & Products, Inc.
7. Piping Technology & Products, Inc.
8. Rilco Manufacturing Co., Inc.
9. Value Engineered Products, Inc.

B. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) minimum compressive strength and vapor barrier.

C. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig (688-kPa) minimum compressive strength.

D. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

E. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

F. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.5 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

2.6 PIPE STANDS

A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.

B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.

C. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.

D. High-Type, Single-Pipe Stand:

1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
2. Base: Stainless steel.
3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

E. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: One or more; plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

F. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:
1. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Pipe Stand Installation:

1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.

2. Curb-Mounted-Type Pipe Stands: Assemble components or fabricate pipe stand and mount on permanent, stationary roof curb. See Division 07 Section "Roof Accessories" for curbs.

G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

J. Install lateral bracing with pipe hangers and supports to prevent swaying.

K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

N. Insulated Piping:

1. Attach clamps and spacers to piping.
   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
   a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
   b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
   c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
   d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
   e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.

5. Pipes NPS 8 (DN 200) and Larger: Include reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers, and metal framing systems and attachments for general service applications.

F. Use stainless-steel pipe hangers attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F (566 deg C),pipes NPS 4 to NPS 24 (DN 100 to DN 600), requiring up to 4 inches (100 mm) of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
4. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
5. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
6. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).
7. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
8. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).

9. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
10. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
11. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
12. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
13. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
14. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
15. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36 (DN 100 to DN 900), with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
16. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
17. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.
18. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction might occur.
19. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
20. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
21. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.

3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb (340 kg).
    b. Medium (MSS Type 32): 1500 lb (680 kg).
    c. Heavy (MSS Type 33): 3000 lb (1360 kg).
13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from hanger.
6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.
7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from trapeze support.
8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
   a. Horizontal (MSS Type 54): Mounted horizontally.
   b. Vertical (MSS Type 55): Mounted vertically.
   c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.

R. Use Mechanical – Expansion Anchors instead of building attachments where required in concrete construction.

END OF SECTION 23 05 29

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SECTION 23 05 53 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.
5. Stencils.
6. Valve tags.
7. Warning tags.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For color, letter style, and graphic representation required for each identification material and device.

C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.

D. Valve numbering scheme.

E. Valve Schedules: For each piping system to include in maintenance manuals.

1.4 COORDINATION

A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.

B. Coordinate installation of identifying devices with locations of access panels and doors.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch (0.8-mm) Stainless steel, 0.025-inch (0.64-mm) Aluminum, 0.032-inch (0.8-mm) or anodized aluminum, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
3. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets or self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
2. Letter Color: Black.
3. Background Color: White.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.

B. Letter Color: Black.

C. Background Color: Yellow.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

2.3 2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.4 2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.

B. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).

C. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).

D. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

E. Fasteners: Stainless-steel rivets or self-tapping screws.

F. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

G. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.5 2.5 VALVE TAGS

A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers.

1. Tag Material: Brass, 0.032-inch (0.8-mm) Stainless steel, 0.025-inch (0.64-mm) Aluminum, 0.032-inch (0.8-mm) or anodized aluminum, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Fasteners: Brass wire-link or beaded chain; or S-hook.

B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.

1. Valve-tag schedule shall be included in operation and maintenance data.

2.6 2.6 WARNING TAGS

A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.

1. Size: Approximately 4 by 7 inches (100 by 178 mm).
2. Fasteners: Brass grommet and wire.
3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
4. Color: Yellow background with black lettering.

PART 3 - EXECUTION

3.1 3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Refrigerant Piping.
1. Refrigerant pipe located in areas other than the room or space where the refrigerating equipment is located shall be identified.
2. The pipe identification shall be located at intervals not exceeding 20 feet (6096 mm) on the refrigerant piping or pipe insulation.
3. The minimum height of lettering of the identification label shall be 1 /2 inch (12.7 mm).
4. The identification shall indicate the refrigerant designation and safety group classification of refrigerant used in the piping system.
5. For Group A2, A3, B2 and B3 refrigerants, the identification shall also include the following statement: "DANGER—Risk of Fire or Explosion. Flammable Refrigerant."

3.4 3.4 DUCT LABEL INSTALLATION

A. Install plastic-laminated, self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

1. Blue: For return air ducts.
2. Yellow: For supply air ducts.
3. Green: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
4. ASME A13.1 Colors and Designs: For hazardous material exhaust.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet (15 m) in each space where ducts are exposed or concealed by removable ceiling system.

3.5 3.5 VALVE-TAG INSTALLATION

A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections on end-use fixtures and units. List tagged valves in schedule.

B. Valve-Tag Application Schedule:

1. Valve-Tag Size and Shape: 1-1/2 inches (38mm), round.
2. Valve-Tag Color: Natural

3. Letter Color: Black

3.6 3.6 WARNING-TAG INSTALLATION

A. Write required message on, and attach warning tags to, equipment and other items where required.

END OF SECTION 23 05 53

SECTION 23 05 93 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Balancing Air Systems:
   a. Variable-air-volume systems.
2. Balancing Hydronic Piping Systems:
   a. Constant-flow hydronic systems.
   b. Variable-flow hydronic systems.
   c. Primary-secondary hydronic systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 SUBMITTALS

A. LEED Submittal:

1. Air-Balance Report for LEED Prerequisite EQ 1: Documentation of work performed for ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."

B. Remaining paragraphs are defined in Division 01 Section "Submittal Procedures" as "Informational Submittals."

C. Coordinate timing of submittals with Division 01 Sections "Construction Progress Documentation" and "Submittal Procedures."

D. See Editing Instruction No. 1 in the Evaluations for timing requirements of submittals.

E. Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

F. Contract Documents Examination Report: Within 30 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.

G. Strategies and Procedures Plan: Within 30 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

H. Certified TAB reports.

I. Sample report forms.

J. Instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC.

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC.
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC as a TAB technician.

B. TAB Conference: Meet with Architect and the Owner and on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items:
   a. The Contract Documents examination report.
   b. The TAB plan.
   c. Coordination and cooperation of trades and subcontractors.
   d. Coordination of documentation and communication flow.

C. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

D. TAB Report Forms: Use standard TAB contractor's forms approved by the Architect and Commissioning Authority.

E. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

1.6 PROJECT CONDITIONS

A. Full Owner Occupancy: Owner will occupy the site and existing building during entire TAB period. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

B. Partial Owner Occupancy: Owner may occupy completed areas of building before Substantial Completion. Cooperate with Owner during TAB operations to minimize conflicts with Owner's operations.

1.7 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Division 23 Section "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems
3. - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.
   1. TAB is required to coordinate and assist during the commissioning of the project.

B. Complete system-readiness checks and prepare reports. Verify the following:

   1. Permanent electrical-power wiring is complete.
   2. Hydronic systems are filled, clean, and free of air.
   3. Automatic temperature-control systems are operational.
   4. Equipment and duct access doors are securely closed.
   5. Balance, smoke, and fire dampers are open.
   6. Isolating and balancing valves are open and control valves are operational.
   7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.

8. Windows and doors can be closed so indicated conditions for system operations can be met.

3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" and SMACNA's "HVAC Systems - Testing, Adjusting, and Balancing" and in this Section.

1. Comply with requirements in ASHRAE 62.1-2004, Section 7.2.2, "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. After testing and balancing, install test ports and duct access doors that comply with requirements in Division 23 Section "Air Duct Accessories."
3. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Division 23 Section "HVAC Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.5 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum-airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been a

C. djusted, adjust the variable-air-volume systems as follows:

1. Set outdoor-air dampers at minimum, and set return- and exhaust-air dampers at a position that simulates full-cooling load.
2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
3. Measure total system airflow. Adjust to within indicated airflow.
4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the
6. same as described for constant-volume air systems.
   a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.
7. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
   a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.
8. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
9. Record final fan-performance data.

D. Pressure-Dependent, Variable-Air-Volume Systems without Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Balance variable-air-volume systems the same as described for constant-volume air systems.
2. Set terminal units and supply fan at full-airflow condition.

3. Adjust inlet dampers of each terminal unit to indicated airflow and verify operation of the static-pressure controller. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
4. Readjust fan airflow for final maximum readings.
5. Measure operating static pressure at the sensor that controls the supply fan if one is installed, and verify operation of the static-pressure controller.
6. Set supply fan at minimum airflow if minimum airflow is indicated. Measure static pressure to verify that it is being maintained by the controller.
7. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.
   a. If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.
8. Measure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.
   a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

E. Pressure-Dependent, Variable-Air-Volume Systems with Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set system at maximum indicated airflow by setting the required number of terminal units at minimum airflow. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.
2. Adjust supply fan to maximum indicated airflow with the variable-airflow controller set at maximum airflow.
3. Set terminal units at full-airflow condition.
4. Adjust terminal units starting at the supply-fan end of the system and continuing progressively to the end of the system. Adjust inlet dampers of each terminal unit to indicated airflow. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
5. Adjust terminal units for minimum airflow.
6. Measure static pressure at the sensor.
7. Measure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

3.6 PROCEDURES FOR MULTIZONE SYSTEMS

A. Set unit at maximum airflow through the cooling coil.

B. Adjust each zone's balancing damper to achieve indicated airflow within the zone.

3.7 PROCEDURES FOR KITCHEN GREASE DUCT

A. Field test all grease ductwork prior to use or concealment of any portion of the grease duct system.

B. Light test.

1. A duct test shall be performed by passing a lamp having not less than 1600 lumens, through the entire section of ductwork to be tested. The lamp shall be open so as to emit light equally in all directions perpendicular to the duct walls. A successful test shall be where the light from the lamp is not visible at any point on the exterior of the duct.

C. Water spray test.
1. A duct test shall be performed by simulating a cleaning operation, of the interior of the duct. A water pump, capable of a flowing outlet pressure of not less than 1200 psi (8,274 kPa) shall be used, along with any necessary hoses and spray nozzles, to apply high pressure water to the inside surfaces of the duct. A successful test shall be where there is no evidence of cleaning water at any point on the exterior of the duct.

3.8 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check liquid level in expansion tank.
3. Check makeup water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation, and set at indicated flow.
5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
6. Set system controls so automatic valves are wide open to heat exchangers.
7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

3.9 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

A. Measure water flow at pumps. Use the following procedures except for positive-displacement pumps:
1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
   a. If impeller sizes must be adjusted to achieve pump performance, obtain approval from Engineer via Architect and comply with requirements in Division 23 Section "Hydronic Pumps."
2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.

a. Monitor motor performance during procedures and do not operate motors in overload conditions.

3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
4. Report flow rates that are not within plus or minus 10 percent of design.

B. Measure flow at all automatic flow control valves to verify that valves are functioning as designed.

C. Measure flow at all pressure-independent characterized control valves, with valves in fully open position, to verify that valves are functioning as designed.

D. Set calibrated balancing valves, if installed, at calculated presettings.

E. Measure flow at all stations and adjust, where necessary, to obtain first balance.

1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

F. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.

G. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:

1. Determine the balancing station with the highest percentage over indicated flow.
2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
3. Record settings and mark balancing devices.

H. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.

I. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.

J. Check settings and operation of each safety valve. Record settings.

3.10 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.

3.11 PROCEDURES FOR PRIMARY-SECONDARY HYDRONIC SYSTEMS

A. Balance the primary circuit flow first and then balance the secondary circuits.

3.12 PROCEDURES FOR HEAT EXCHANGERS

A. Measure water flow through all circuits.

B. Adjust water flow to within specified tolerances.

C. Measure inlet and outlet water temperatures.

D. Measure inlet steam pressure.

E. Check settings and operation of safety and relief valves. Record settings.

3.13 PROCEDURES FOR REFRIGERANT PIPING

A. Refrigerant piping systems that are erected in the field, shall be pressure tested for strength and leak tested for tightness, with both high and low-pressure sides of each system.

B. Refrigerant pipe and joints installed in the field shall be exposed for visual inspection and testing prior to being covered or enclosed.

C. The medium used for field pressure testing the refrigeration system shall be one of the following inert gases: oxygen-free nitrogen, helium argon or premixed nonflammable oxygen-free nitrogen with a tracer gas of hydrogen or helium.

D. Factory tests shall be performed with dry nitrogen or other nonflammable, nonreactive, dried gas. Oxygen, air or mixtures containing them shall not be used. The means used to build up the test pressure shall have either a pressure-limiting device or a pressure-reducing device and a gauge on the outlet side. The pressure-relief device shall be set above the test pressure but low enough to prevent permanent deformation of the refrigeration system's components.

E. The means used to pressurize the refrigerant piping system shall have on its outlet side, a test pressure measuring device and either a pressure-limiting device or a pressure-reducing device. The test pressure measuring device shall have an accuracy of ±3 percent or less of the test pressure, and shall have a resolution of 5% or less of the test pressure.

F. Refrigerating system components and refrigerant piping shall be tested in accordance with ASME B31.5.

G. A passing test result shall have no rupture or structural failure of any system component or refrigerant piping. Refrigerant piping and tubing greater than 3/4 inches in diameter shall be tested in accordance with ASHRAE 15.

H. The installing contractor or registered design professional of record shall issue a certificate of test to the code official for all refrigeration systems containing 55 pounds (25 kg) or more of refrigerant. The certificate shall give the test date, name of the refrigerant, test medium and the field test pressure applied to the high- pressure side and the low-pressure side of the refrigeration system. The certification of test shall be signed by the installing contractor or registered design professional and shall be made part of the public record.

3.14 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

3.15 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

3.16 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.
4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each steam coil:

1. Dry-bulb temperature of entering and leaving air.
2. Airflow.

3. Air pressure drop.
4. Inlet steam pressure.

D. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

3.17 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.

1. Measure and record the operating speed, airflow, and static pressure of each fan.
2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
3. Check the refrigerant charge.
4. Check the condition of filters.
5. Check the condition of coils.
6. Check the operation of the drain pan and condensate-drain trap.
7. Check bearings and other lubricated parts for proper lubrication.
8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:

1. New filters are installed.
2. Coils are clean and fins combed.
3. Drain pans are clean.
4. Fans are clean.
5. Bearings and other parts are properly lubricated.
6. Deficiencies noted in the preconstruction report are corrected.

C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.

1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
4. Balance each air outlet.

3.18 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent.
2. Air Outlets and Inlets: Plus or minus 10 percent.
3. Heating-Water Flow Rate: Plus or minus 10 percent.
4. Cooling-Water Flow Rate: Plus or minus 10 percent.

3.19 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare biweekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.20 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.

9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:
    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.
12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:
    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic and geothermal well distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:
    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches (mm), and bore.
    i. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
    j. Number, make, and size of belts.
    k. Number, type, and size of filters.
2. Motor Data:
    a. Motor make, and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.
    e. Sheave make, size in inches (mm), and bore.

f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).

3. Test Data (Indicated and Actual Values):
   a. Total air flow rate in cfm (L/s).
   b. Total system static pressure in inches wg (Pa).
   c. Fan rpm.
   d. Discharge static pressure in inches wg (Pa).
   e. Filter static-pressure differential in inches wg (Pa).
   f. Preheat-coil static-pressure differential in inches wg (Pa).
   g. Cooling-coil static-pressure differential in inches wg (Pa).
   h. Heating-coil static-pressure differential in inches wg (Pa).
   i. Outdoor airflow in cfm (L/s).
   j. Return airflow in cfm (L/s).
   k. Outdoor-air damper position.
   l. Return-air damper position.
   m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:
   a. System identification.
   b. Location.
   c. Coil type.
   d. Number of rows.
   e. Fin spacing in fins per inch (mm) o.c.
   f. Make and model number.
   g. Face area in sq. ft. (sq. m).
   h. Tube size in NPS (DN).
   i. Tube and fin materials.
   j. Circuiting arrangement.
2. Test Data (Indicated and Actual Values):
   a. Air flow rate in cfm (L/s).
   b. Average face velocity in fpm (m/s).
   c. Air pressure drop in inches wg (Pa).
   d. Outdoor-air, wet- and dry-bulb temperatures in deg F (deg C).
   e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
   f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
   g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
   h. Water flow rate in gpm (L/s).
   i. Water pressure differential in feet of head or psig (kPa).
   j. Entering-water temperature in deg F (deg C).
   k. Leaving-water temperature in deg F (deg C).

G. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:
   a. System identification.
   b. Location.
   c. Make and type.
   d. Model number and size.
   e. Manufacturer's serial number.
   f. Arrangement and class.
   g. Sheave make, size in inches (mm), and bore.

h. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).

2. Motor Data:
   a. Motor make, and frame type and size.
   b. Horsepower and rpm.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.
   e. Sheave make, size in inches (mm), and bore.
   f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
   g. Number, make, and size of belts.
3. Test Data (Indicated and Actual Values):
   a. Total airflow rate in cfm (L/s).
   b. Total system static pressure in inches wg (Pa).
   c. Fan rpm.
   d. Discharge static pressure in inches wg (Pa).
   e. Suction static pressure in inches wg (Pa).

H. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:
   a. System and air-handling-unit number.
   b. Location and zone.
   c. Traverse air temperature in deg F (deg C).
   d. Duct static pressure in inches wg (Pa).
   e. Duct size in inches (mm).
   f. Duct area in sq. ft. (sq. m).
   g. Indicated air flow rate in cfm (L/s).
   h. Indicated velocity in fpm (m/s).
   i. Actual air flow rate in cfm (L/s).
   j. Actual average velocity in fpm (m/s).
   k. Barometric pressure in psig (Pa).

I. System-Coil Reports: For reheat coils and water coils of terminal units & baseboard, include the following:

1. Unit Data:
   a. System and air-handling-unit identification.
   b. Location and zone.
   c. Room or riser served.
   d. Coil make and size.
   e. Flowmeter type.
2. Test Data (Indicated and Actual Values):
   a. Air flow rate in cfm (L/s).
   b. Entering-water temperature in deg F (deg C).
   c. Leaving-water temperature in deg F (deg C).
   d. Water pressure drop in feet of head or psig (kPa).
   e. Entering-air temperature in deg F (deg C).
   f. Leaving-air temperature in deg F (deg C).

J. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:
    a. Unit identification.
    b. Location.
    c. Service.
    d. Make and size.
    e. Model number and serial number.
    f. Water flow rate in gpm (L/s).
    g. Water pressure differential in feet of head or psig (kPa).
    h. Required net positive suction head in feet of head or psig (kPa).
    i. Pump rpm.
    j. Impeller diameter in inches (mm).
    k. Motor make and frame size.
    l. Motor horsepower and rpm.
    m. Voltage at each connection.
    n. Amperage for each phase.
    o. Full-load amperage and service factor.
    p. Seal type.
2. Test Data (Indicated and Actual Values):
    a. Static head in feet of head or psig (kPa).
    b. Pump shutoff pressure in feet of head or psig (kPa).
    c. Actual impeller size in inches (mm).
    d. Full-open flow rate in gpm (L/s).
    e. Full-open pressure in feet of head or psig (kPa).
    f. Final discharge pressure in feet of head or psig (kPa).
    g. Final suction pressure in feet of head or psig (kPa).
    h. Final total pressure in feet of head or psig (kPa).
    i. Final water flow rate in gpm (L/s).
    j. Voltage at each connection.
    k. Amperage for each phase.

K. Instrument Calibration Reports:

1. Report Data:
    a. Instrument type and make.
    b. Serial number.
    c. Application.
    d. Dates of use.
    e. Dates of calibration.

L. Heat Pump Test Reports:

1. Unit Data:
    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Refrigerant type.
    g. Number of circuits per module.
    h. Number of compressors per module.
2. Test Data (Indicated and Actual Values):
    a. Total sink water flow rate in gpm (L/s), in cooling mode.
    b. Total load water flow rate in gpm (L/s), in cooling mode.

c. Total sink water flow rate in gpm (L/s), in heating mode.
d. Total load water flow rate in gpm (L/s), in heating mode.
e. Total sink water flow rate in gpm (L/s), in simultaneous mode.
f. Total load water flow rate in gpm (L/s), in simultaneous mode.
g. Entering-sink water temperature in deg F (deg C), in cooling mode.
h. Leaving-sink water temperature in deg F (deg C), in cooling mode.
i. Entering-load water temperature in deg F (deg C), in cooling mode.
j. Leaving-load water temperature in deg F (deg C), in cooling mode.
k. Entering-sink water temperature in deg F (deg C), in heating mode.
l. Leaving-sink water temperature in deg F (deg C), in heating mode.
m. Entering-load water temperature in deg F (deg C), in heating mode.
n. Leaving-load water temperature in deg F (deg C), in heating mode.
o. Entering-sink water temperature in deg F (deg C), in simultaneous mode.
p. Leaving-sink water temperature in deg F (deg C), in simultaneous mode.
q. Entering-load water temperature in deg F (deg C), in simultaneous mode.
r. Leaving-load water temperature in deg F (deg C), in simultaneous mode.

M. Heat Exchanger Test Reports:

1. Unit Data:
   a. Unit identification.
   b. Location.
   c. Make and type.
   d. Model number and unit size.
   e. Manufacturer's serial number.
2. Test Data (Indicated and Actual Values):
   a. Total water flow rate in gpm (L/s), on hot side.
   b. Total water flow rate in gpm (L/s), on cold side.
   c. Entering-water temperature in deg F (deg C), on hot side.
   d. Leaving- water temperature in deg F (deg C), on hot side
   e. Entering-water temperature in deg F (deg C), on cold side.
   f. Leaving- water temperature in deg F (deg C), on cold side

N. Makeup Air Unit Test Reports: For makeup air units with coils, include the following:

1. Unit Data:
   a. Unit identification.
   b. Location.
   c. Make and type.
   d. Model number and unit size.
   e. Manufacturer's serial number.
   f. Unit arrangement and class.
   g. Discharge arrangement.
   h. Sheave make, size in inches (mm), and bore.
   i. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
   j. Number, make, and size of belts.
   k. Number, type, and size of filters.
2. Motor Data:
   a. Motor make, and frame type and size.
   b. Horsepower and rpm.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.

e. Sheave make, size in inches (mm), and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).

3. Test Data (Indicated and Actual Values):
   a. Total air flow rate in cfm (L/s).
   b. Total system static pressure in inches wg (Pa).
   c. Fan rpm.
   d. Discharge static pressure in inches wg (Pa).
   e. Filter static-pressure differential in inches wg (Pa).
   f. Preheat-coil static-pressure differential in inches wg (Pa).

O. Unit Heater Test Reports: For unit heaters with coils, include the following:

1. Unit Data:
   a. Unit identification.
   b. Location.
   c. Make and type.
   d. Model number and unit size.
   e. Manufacturer's serial number.
2. Motor Data:
   a. Motor make, and frame type and size.
   b. Horsepower.
   c. Volts, phase, and hertz.
   d. Full-load amperage and service factor.
3. Test Data (Indicated and Actual Values):
   a. Total air flow rate in cfm (L/s).

3.21 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.
2. Check the following for each system:
   a. Measure airflow of at least 10 percent of air outlets.
   b. Measure water flow of at least 5 percent of terminals.
   c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
   d. Verify that balancing devices are marked with final balance position.
   e. Note deviations from the Contract Documents in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Architect and Owner.
2. The TAB contractor's test and balance engineer shall conduct the inspection in the presence of Architect and Owner.
3. Owner shall randomly select measurements, documented in the final report, to be rechecked. Rechecking shall be limited to either 10 percent of the total measurements recorded or the extent of measurements that can be accomplished in a normal 8-hour business day.

4. If rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."
5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.
2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

3.22 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 23 05 93

SECTION 23 07 13 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply and outdoor air.
2. Indoor, exposed supply and outdoor air.
3. Indoor, concealed return located in unconditioned space.
4. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
5. Indoor, exposed exhaust between isolation damper and penetration of building exterior.

B. Related Sections:

1. Division 23 Section "HVAC Equipment Insulation."
2. Division 23 Section "HVAC Piping Insulation."
3. Division 23 Section "Metal Ducts" for duct liners.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content and chemical components.
2. Laboratory Test Reports for Credit EQ 4: For adhesives and sealants, documentation indicating that product complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.

3. Detail application of field-applied jackets.
4. Detail application at linkages of control devices.

D. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use. Sample sizes are as follows:

1. Sheet Form Insulation Materials: 12 inches (300 mm) square.
2. Sheet Jacket Materials: 12 inches (300 mm) square.
3. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

E. Qualification Data: For qualified Installer.

F. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

G. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for

installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. CertainTeed Corp.; SoftTouch Duct Wrap.
   b. Johns Manville; Microlite.
   c. Manson Insulation Inc.; Alley Wrap.

G. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:

   a. CertainTeed Corp.; Commercial Board.
   b. Johns Manville; 800 Series Spin-Glas.
   c. Manson Insulation Inc.; AK Board.

2.2 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Board: Structural-grade, press-molded, xonolite calcium silicate, fireproofing board suitable for operating temperatures up to 1700 deg F (927 deg C). Comply with ASTM C 656, Type II, Grade 6. Tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:

B. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
      a. Johns Manville; Firetemp Wrap.
      b. Thermal Ceramics; FireMaster Duct Wrap.
      c. 3M; Fire Barrier Wrap Products.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
      a. Aeroflex USA, Inc.; Aeroseal.
      b. Armacell LLC; Armaflex 520 Adhesive.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.

   2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
   b. Eagle Bridges - Marathon Industries; 225.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
   b. Eagle Bridges - Marathon Industries; 225.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. Dow Corning Corporation; 739, Dow Silicone.
   b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
   c. P.I.C. Plastics, Inc.; Welding Adhesive.
2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
3. Use adhesive that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company
   b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
   c. Vimasco Corporation; 749.
2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-30.
   b. Eagle Bridges - Marathon Industries; 501.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-35.
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.03 metric perm) at 35-mil (0.9-mm) dry film thickness.
3. Service Temperature Range: 0 to 180 deg F (Minus 18 to plus 82 deg C).
4. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
5. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, , the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Encacel.
   b. Eagle Bridges - Marathon Industries; 570.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 60-95/60-96.
2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.033 metric perm) at 30-mil (0.8-mm) dry film thickness.
3. Service Temperature Range: Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).
4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
5. Color: White.

E. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
   b. Eagle Bridges - Marathon Industries; 550.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms (1.2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.
   b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
   c. Vimasco Corporation; 713 and 714.
3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
4. Service Temperature Range: 0 to plus 180 deg F (Minus 18 to plus 82 deg C).
5. Color: White.

2.6 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   b. Eagle Bridges - Marathon Industries; 405.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: Aluminum.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Use sealants that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

B. ASJ Flashing Sealants, and Vinyl and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, , the following:
   a. Aeroflex
   b. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   c. Johns mansville
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: White.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
7. Use sealants that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms (0.86 metric perm) when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. Metal Jacket:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
   b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
   c. RPR Products, Inc.; Insul-Mate.
2. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.
   a. Sheet and roll stock ready for shop or field sizing.

b. Finish and thickness are indicated in field-applied jacket schedules.
c. Moisture Barrier for Indoor Applications: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
d. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.

2.9 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. ABI, Ideal Tape Division; 491 AWF FSK.
   b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
   c. Compac Corporation; 110 and 111.
2. Width: 3 inches (75 mm).
3. Thickness: 6.5 mils (0.16 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, , the following:
   a. ABI, Ideal Tape Division; 488 AWF.
   b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
   c. Compac Corporation; 120.
2. Width: 2 inches (50 mm).
3. Thickness: 3.7 mils (0.093 mm).
4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

2.10 SECUREMENTS

A. Bands:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. ITW Insulation Systems; Gerrard Strapping and Seals.
   b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.
2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015 inch (0.38 mm) thick, 1/2 inch (13 mm) wide with wing seal or closed seal.
3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm) diameter shank, length to suit depth of insulation indicated.
   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
      1) AGM Industries, Inc.; CWP-1.
      2) GEMCO; CD.
      3) Midwest Fasteners, Inc.; CD.
2. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
      1) AGM Industries, Inc.; CHP-1.
      2) GEMCO; Cupped Head Weld Pin.
      3) Midwest Fasteners, Inc.; Cupped Head.
3. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
      1) AGM Industries, Inc.; Tactoo Perforated Base Insul-Hangers.
      2) GEMCO; Perforated Base.
      3) Midwest Fasteners, Inc.; Spindle.
   b. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
   c. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
   d. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.
4. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:
   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
      1) AGM Industries, Inc.; Tactoo Self-Adhering Insul-Hangers.
      2) GEMCO; Peel & Press.
      3) Midwest Fasteners, Inc.; Self Stick.
   b. Baseplate: Galvanized carbon-steel sheet, 0.030 inch (0.76 mm) thick by 2 inches (50 mm) square.
   c. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
   d. Adhesive-backed base with a peel-off protective cover.
5. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.
   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
      1) AGM Industries, Inc.; RC-150.
      2) GEMCO; R-150.

3) Midwest Fasteners, Inc.; WA-150.

b. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

D. Wire: 0.080-inch (2.0-mm) nickel-copper alloy.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, the following:
   a. American elements
   b. Brookfield Wire
   c. C & F Wire.

2.11 CORNER ANGLES

A. Stainless-Steel Corner Angles: 0.024 inch (0.61 mm) thick, minimum 1 by 1 inch (25 by 25 mm), stainless steel according to ASTM A 167 or ASTM A 240/A 240M, Type 304.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.
   a. For below ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).

1. Comply with requirements in Division 07 Section "Penetration Firestopping" firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.

3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
    b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not overcompress insulation during installation.
    e. Impale insulation over pins and attach speed washers.
    f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).
5. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
    a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.

b. On duct sides with dimensions larger than 18 inches (450 mm), space pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.
e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1 inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
   a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
   b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).
5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.6 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

   1. Draw jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
   2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of lagging adhesive.
   3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

   1. Draw jacket material smooth and tight.
   2. Install lap or joint strips with same material as jacket.
   3. Secure jacket to insulation with manufacturer's recommended adhesive.
   4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
   5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.7 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Division 07 Section "Penetration Firestopping."

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.9 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:

1. Indoor, concealed supply and outdoor air.
2. Indoor, concealed return located in unconditioned space.
3. Indoor, concealed exhaust between isolation damper and penetration of building exterior.
4. Indoor, exposed exhaust between isolation damper and penetration of building exterior.

B. Items Not Insulated:

1. Fibrous-glass ducts.
2. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
3. Factory-insulated flexible ducts.
4. Factory-insulated plenums and casings.
5. Flexible connectors.
6. Vibration-control devices.

7. Factory-insulated access panels and doors.

3.10 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, rectangular, supply-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches (50 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.

B. Concealed, rectangular, return-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches (50 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.

C. Concealed, rectangular, outdoor-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 2 inches (50 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.

D. Concealed, rectangular, exhaust-air duct insulation between isolation damper and penetration of building exterior shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches (50 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.

E. Exposed, rectangular, supply-air duct insulation shall bethe following:

1. Mineral-Fiber Board: 2 inches (50 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.

F. Exposed, rectangular, outdoor-air duct insulation shall be the following:

1. Mineral-Fiber Board: 2 inches (50 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.

G. Exposed, rectangular, exhaust-air duct insulation shall be the following:

1. Mineral-Fiber Board: 2 inches (50 mm) thick and 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.

END OF SECTION 23 07 13

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SECTION 23 07 19 - HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Condensate drain piping, indoors.
2. Chilled-water and brine piping, indoors.
3. Heating hot-water piping, indoors.
4. Refrigerant suction and hot-gas piping, indoors and outdoors.

B. Related Sections:

1. Division 23 Section "HVAC Equipment Insulation."
2. Division 23 Section "Duct Insulation."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

B. LEED Submittals:

1. Product Data for Credit EQ 4.1: For adhesives and sealants, documentation including printed statement of VOC content and chemical components.
2. Laboratory Test Reports for Credit EQ 4: For adhesives and sealants, documentation indicating that product complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

C. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties.

6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

D. Samples: For each type of insulation and jacket indicated. Identify each Sample, describing product and intended use.

1. Preformed Pipe Insulation Materials: 12 inches (300 mm) long by NPS 2 (DN 50).
2. Sheet Form Insulation Materials: 12 inches (300 mm) square.
3. Jacket Materials for Pipe: 12 inches (300 mm) long by NPS 2 (DN 50).
4. Sheet Jacket Materials: 12 inches (300 mm) square.
5. Manufacturer's Color Charts: For products where color is specified, show the full range of colors available for each type of finish material.

E. Qualification Data: For qualified Installer.

F. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

G. Field quality-control reports.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.

B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.

1. Piping Mockups:
   a. One 10-foot (3-m) section of NPS 2 (DN 50) straight pipe.
   b. One each of a 90-degree threaded, welded, and flanged elbow.
   c. One each of a threaded, welded, and flanged tee fitting.
   d. One NPS 2 (DN 50) or smaller valve, and one NPS 2-1/2 (DN 65) or larger valve.
   e. Four support hangers including hanger shield and insert.
   f. One threaded strainer and one flanged strainer with removable portion of insulation.

g. One threaded reducer and one welded reducer.
h. One pressure temperature tap.
i. One mechanical coupling.

2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
4. Obtain Architect's approval of mockups before starting insulation application.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
7. Demolish and remove mockups when directed.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.7 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials with UV Protection. Comply with ASTM C 534, Type I for tubular materials.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Aeroflex USA, Inc.; Aerocel.
   b. Armacell LLC; AP Armaflex.
   c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

G. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Johns Manville; Micro-Lok.
   b. Knauf Insulation; 1000-Degree Pipe Insulation.
   c. Owens Corning; Fiberglas Pipe Insulation.
2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

H. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. (40 kg/cu. m) or more. Thermal conductivity (k-value) at 100 deg F (55 deg C) is 0.29 Btu x in./h x sq. ft. x deg F (0.042 W/m x K) or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Johns Manville; MicroFlex.
   b. Knauf Insulation; Pipe and Tank Insulation.
   c. Owens Corning; Fiberglas Pipe and Tank Insulation.

2.2 INSULATING CEMENTS

A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Ramco Insulation, Inc.; Super-Stik.
   b. Isolatek International
   c. Owens Corning

B. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Johns Manville
   b. Owens Corning
   c. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:

   a. Aeroflex USA, Inc.; Aeroseal.
   b. Armacell LLC; Armaflex 520 Adhesive.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-75.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
   b. Eagle Bridges - Marathon Industries; 225.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
   b. Eagle Bridges - Marathon Industries; 225.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. Dow Corning Corporation; 739, Dow Silicone.
   b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
   c. P.I.C. Plastics, Inc.; Welding Adhesive.
2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

   1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
      a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
      b. Stego Mastic
      c. Vimasco Corporation; 749.
   2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
   3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
   4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
   5. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Encacel.
      b. Eagle Bridges - Marathon Industries; 570.
      c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 60-95/60-96.
   2. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.033 metric perm) at 30-mil (0.8-mm) dry film thickness.
   3. Service Temperature Range: Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).
   4. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
   5. Color: White.

D. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
      a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
      b. Eagle Bridges - Marathon Industries; 550.

c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms (1.2 metric perms) at 0.0625-inch (1.6-mm) dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

2.5 LAGGING ADHESIVES

A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.

1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.
   b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
   c. Vimasco Corporation; 713 and 714.
3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
4. Service Temperature Range: 0 to plus 180 deg F (Minus 18 to plus 82 deg C).
5. Color: White.

2.6 SEALANTS

A. Joint Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Permanently flexible, elastomeric sealant.
3. Service Temperature Range: Minus 100 to plus 300 deg F (Minus 73 to plus 149 deg C).
4. Color: White or gray.
5. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   b. Eagle Bridges - Marathon Industries; 405.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: Aluminum.

6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. ASJ Flashing Sealants and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. Aeroflex
   b. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   c. Sika
2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
5. Color: White.
6. For indoor applications, use sealants that have a VOC content of 420 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.7 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
   1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.

2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. Johns Manville; Zeston.
   b. P.I.C. Plastics, Inc.; FG Series.
   c. Proto Corporation; LoSmoke.
2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
   a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Metal Jacket:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.

b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
c. RPR Products, Inc.; Insul-Mate.

2. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005, Temper H-14.
   a. Sheet and roll stock ready for shop or field sizing.
   b. Finish and thickness are indicated in field-applied jacket schedules.
   c. Moisture Barrier for Indoor Applications: 1-mil- (0.025-mm-) thick, heat-bonded polyethylene and kraft paper.
   d. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
   e. Factory-Fabricated Fitting Covers:
      1) Same material, finish, and thickness as jacket.
      2) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
      3) Tee covers.
      4) Flange and union covers.
      5) End caps.
      6) Beveled collars.
      7) Valve covers.
      8) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. ABI, Ideal Tape Division; 428 AWF ASJ.
   b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
   c. Compac Corporation; 104 and 105.
2. Width: 3 inches (75 mm).
3. Thickness: 11.5 mils (0.29 mm).
4. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   a. ABI, Ideal Tape Division; 370 White PVC tape.
   b. Compac Corporation; 130.
   c. Venture Tape; 1506 CW NS.
2. Width: 2 inches (50 mm).
3. Thickness: 6 mils (0.15 mm).
4. Adhesion: 64 ounces force/inch (0.7 N/mm) in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch (3.3 N/mm) in width.

C. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
   a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
   b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
   c. Compac Corporation; 120.
   d. Venture Tape; 3520 CW.
   2. Width: 2 inches (50 mm).
   3. Thickness: 3.7 mils (0.093 mm).
   4. Adhesion: 100 ounces force/inch (1.1 N/mm) in width.
   5. Elongation: 5 percent.
   6. Tensile Strength: 34 lbf/inch (6.2 N/mm) in width.

2.10 SECUREMENTS

A. Bands:

   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
      a. ITW Insulation Systems; Gerrard Strapping and Seals.
      b. Jera Line
      c. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.
   2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304; 0.015 inch (0.38 mm) thick, 1/2 inch (13 mm) wide with wing seal or closed seal.
   3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

C. Wire: 0.080-inch (2.0-mm) nickel-copper alloy.

   1. Manufacturers: Subject to compliance with requirements, available products that may be incorporated into the Work include, the following:
      a. C & F Wire.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

   1. Verify that systems to be insulated have been tested and are free of defects.
   2. Verify that surfaces to be insulated are clean and dry.
   3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that w

B. ill adversely affect insulation application.

C. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils (0.127 mm) thick and an epoxy finish 5 mils (0.127 mm) thick if operating in a temperature range between 140 and 300 deg F (60 and 149 deg C). Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F (0 and 149 deg C) with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

D. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

E. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.
   a. For below-ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 07 Section "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and unifor

3. m contour that is uniform with adjoining pipe insulation.
4. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
5. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pip
6. e insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
7. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicke
8. r. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable
9. reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
10. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
11. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
12. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate e
13. nds with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
14. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with i
3. nsulation and jacket.
4. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.

5. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
6. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7 INSTALLATION OF MINERAL-FIBER INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.

2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.

5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

E. Where PVDC jackets are indicated, install as follows:

1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
2. Wrap factory-presized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches (50 mm) over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
3. Continuous jacket can be spiral-wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches (850 mm) or less. The 33-1/2-inch- (850-mm-) circumference limit allows for 2-inch- (50-mm-) overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.9 FINISHES

A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
   a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, for each pipe service defined in the "Piping Insulation Schedule, General" Article.

D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Condensate and Equipment Drain Water below 60 Deg F (16 Deg C):

1. All Pipe Sizes: Insulation shall be one of the following:
   a. Flexible Elastomeric: 1 inch (25 mm) thick.

B. Chilled Water and Brine, above 40 Deg F (5 Deg C):

1. NPS 1-1/4 (DN 32) and Smaller: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe, Type I: 1/2 inch (14 mm) thick.
2. NPS 1-1/2 (DN 40) and Larger: Insulation shall be the following:
   a. Mineral-Fiber Preformed Pipe, Type I: 1 inches (25 mm) thick.

C. Heating-Hot-Water Supply and Return, 200 Deg F (93 Deg C) and Below:

1. NPS 1-1/4 (DN 32)and Smaller: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe, Type I: 1-1/2 inch (25 mm) thick.
2. NPS 1-1/2 (DN 40) and Larger: Insulation shall be the following:
   a. Mineral-Fiber, Preformed Pipe, Type I: 2 inches (50 mm) thick.

D. Geothermal Source Water Piping:

1. All Pipe Sizes: Insulation for piping located within the pump room and the vault shall be the following:
   a. Flexible Elastomeric: 2 inch (50 mm) thick.

3.13 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.

D. Piping, Exposed

1. PVC 20 mils (0.5 mm) thick.

3.14 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.

D. Piping, Exposed:

1. PVC: 30 mils (0.8 mm) thick.

END OF SECTION 23 07 19

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SECTION 23 08 00 - COMMISSIONING OF HVAC SYSTEMS

PART 1 - GENERAL

1.1 SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned in this project. The Owner and the CxA reserves the right to amend this list at any time during the construction and acceptance process.

HVAC

1. Air Handling and Ventilation Systems
2. Pumps
3. General Exhaust System
4. Kitchen Make-Up and Exhaust System
5. Individual Temperature Controls
6. Water to Water Heat Pumps
7. Terminal Equipment – VAVs
8. BMS Controls
9. Glycol Make-Up Pump
10. Ductless Split System
11. Unit Heaters

1.2 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All of the following sections apply to the Work of this section. General specifications for commissioning responsibilities, abbreviation definitions and reporting requirements are provided in the following sections:

Section 019113 – General Commissioning Requirements

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 FUNCTIONAL TESTING SUPPORT REQUIREMENTS

A. General Requirements

1. A functional performance test shall be performed on each complete system. Each function shall be demonstrated to the satisfaction of the CxA based on the written test procedure developed by the CxA to demonstrate conformance to the requirements of the Contract Documents.
2. Each functional performance test shall be performed, witnessed and signed off by the CxA. The CxA and the PC will perform the functional testing together. Any exceptions to this will be made clear to the Owner as to the reason and justification.

3. The functional performance testing shall be conducted in accordance with prior approved procedures and documented as required.
4. The PC shall notify the project team, the CxA, and Design Consultants, at least two weeks prior to the date of readiness for functional performance tests. The seasonal functional performance test periods shall be scheduled over a single block of days. The schedule of functional performance tests shall be based on the construction completion schedule.
5. Prefunctional Checkout: The PC will coordinate submission of a written plan, for approval by the CxA, indicating the procedures to test, checkout and adjust the control system prior to formal full system functional testing by the commissioning team. The proposed plan shall include the following:

    a. List of devices and specific input/output (I/O) points with unique addresses and point names.
    b. Step-by-step procedures for testing each controller, hardware installation, wiring connections, software downloads.
    c. Plan for calibrating valve and damper actuators, transmitters and sensors.
    d. Proposed log and checkout sheet formats used to document the process.

6. Commissioning Documentation:

    a. The PC will coordinate provision of the following documentation prior to commencement of the formal acceptance phase:

        1) Full “as-built” set of submittals, control drawings and sequence of operations.
        2) List of schedules and set points
        3) Copy of control software on hard media.
        4) Screenshots of all operator workstation graphics.
        5) Marking of all system sensors, control valves and dampers, and thermostats on the mechanical drawings and floor plans.

    b. Test Equipment: Where special testing equipment, tools and instruments are required to accomplish start-up, testing, adjustments, provide such at no extra cost to the Owner and/or CxA for use during acceptance testing.

7. Point-to-Point Checkout: Each input/output device and control point shall be inspected and verified for proper installation and functionality. Each control point’s wiring, signal and response shall be checked and documented. A checkout sheet itemizing each device shall be filled out, dated and approved by the PC for submission to the CxA. The point-to-point checkout must be complete before the commencement of the commissioning functional tests.
8. Controller and Workstation Checkout: A field checkout of all controllers and front end equipment (computers, printers, modems, etc.) shall be conducted to verify proper operation of both hardware and software. A checkout sheet itemizing each device and a description of the associated tests shall be prepared and submitted to the CxA and Owner or Owner’s representative before the commencement of the commissioning functional tests.
9. The PC will be required to provide demonstration that all specified hardware and software has been provided; graphical user interfaces are complete, displaying current data that updates and refreshes within the times listed in the specification; all specified network connections (e.g. to the internet/LAN/WAN) are established; login and system security is set up; utilities for alarming (local and remote), scheduling, reporting, trending, graphic templates/editing capability are programmed and complete.

10. The PC will be required to verify and certify in writing that all input and out points are operating properly, calibrated and annunciate properly on the BMS. These points will then be verified by the CxA.
11. The PC will be required to verify and certify in writing that all sequences of operations that were programmed are operating as per the design intent. The demonstration of these sequences will be performed at least once by the PC as part of their independent commissioning process and then in the presence of the CxA, as directed by the CxA.
12. All reports, alarms and graphics must be fully completed and certified, in writing by the PC, that these items are completed and have been verified. This includes, but is not limited to:

    a. All system graphics including BACnet, Lon or ModBus interfaces.
    b. Alarms including setpoints, graphical annunciation, cell phone annunciation, email annunciation, etc.
    c. Trending of any point defined by the CxA.

13. All alarms. Any alarm that is to be annunciated will include the appropriate text describing the alarm. System code or any other code that is not immediately intuitive to the system operator is not acceptable. The owner will not be responsible for programming or developing any text for the annunciation of the alarms on any device. This includes local panels, BMS interface or remote wireless annunciation or notification.
14. The CxA will perform a point-to-point verification of all digital outputs, digital inputs, analog outputs, analog inputs, universal inputs and universal outputs. **The PC will be responsible for providing the required support and representation during this testing.**
15. The CxA will test all sequences of operations for selected equipment. **The PC will be responsible for providing the required support and representation during this testing.**
16. A username and password will be provided to the CxA with appropriate read/write privileges.
17. The PC will be required to coordinate demonstration of system integration.

B. Air Handling and Ventilation System

1. The contractor will test all AHU safeties including freezestats, high pressure and low pressure switches. Smoke and fire shutdowns will be tested when the fire alarm and smoke systems are completed and interconnected. The BMS contractor will be required to set all pressure switches with a “Magnahelic” type gauge prior to the CxA verifying the pressure setpoint and operation.
2. All sequence of operations pertaining to the AHU and RF including start/stop, fan/motor speed control, temperature control, heat pipe operation (if applicable) damper control, humidification, dehumidification, airflow control, and air flow delivery performance, economizer operation will be tested.
3. Fan rotation and vibration isolation will be observed and verified.
4. The energy wheel and bypass operation will be tested. Various air flows will tested, included full air-side economizer (if applicable) will be tested to verify proper airflow of the AHU during full air-side economizer operation and minimum air flow operation.
5. The performance of the energy wheel will be trended to verify performance.
6. Full air flow tests will be performed during full air side economizer and non-economizer operations.
7. Demand side control operation will be tested.
8. Airflow stations will be verified for repeatability through the operating range. The TAB contractor is required to calibrate all air flow stations, PRIOR to AHU sequence of operations testing.

9. Confirm P-Trap and condenser water pump operation.

C. Pumps

1. The contractor and the manufacturer's representative will be required to demonstrate that all pumps are properly aligned, the pumps operate in the proper direction, and that the overload protective devices are installed properly and set to the proper settings.
2. The contractor will be required to demonstrate in writing (TAB Report) that the pumps are balanced to achieve the specified design flows, including motor performance data as specified in the TAB specifications.
3. The contractor will be required to demonstrate that the pumps can start, stop, modulate speed (if required), and the lead/lag sequence performs as per the sequence of operations. In addition, a representative will be required to manually operate all hand valves.
4. The contractor will be required to demonstrate that the construction strainers have been removed and that the strainer can be properly blown down, accessed, and pulled for proper maintenance.
5. The make-up to the system will be verified for properly line-up and pressure setting.
6. The expansion tank for the system will be verified for proper line-up and charge, isolated from the system.representative will be present to demonstrate all of the sequences of operations residing in the manufacturer's control panel AND the BMS software (as required by the sequence of operations).

D. Exhaust Fans

1. Test all exhaust fan safeties, including high pressure and low pressure switches. Smoke and fire shutdowns will be tested when the fire alarm and smoke systems are completed and interconnected. The BMS contractor will be required to set all pressure switches with a "Magnahelic" type gauge prior to the CxA verifying the pressure setpoint and operation.
2. All sequence of operations pertaining to the EF, including start/stop (time of day, temperature control or other), damper control, airflow control, and air flow delivery performance will be tested.
3. The speed control and amp draw of the motor will be verified.
4. Fan rotation and vibration isolation will be observed and verified.

E. Kitchen Make-Up and Exhaust System

1. Interlock of the kitchen hood with the exhaust fan and make-up air unit will be demonstrated by the installing contractor.
2. All sequence of operations pertaining to the KEF, including start/stop, speed, and temperature control, air flow delivery, and pressurization performance will be tested.
3. Integration with the fire alarm and fire protection system will be demonstrated, including automatic and manual operation, as well as disable/lockout functions for the KEF.
4. All safeties will be demonstrated, including emergency gas shutoff, gas valve lockout, fan disable, etc.
5. Any integration with the BMS will be demonstrated, including graphics and alarm annunciation.

F. Individual Temperature Controls

1. Any equipment that is not controlled by the BMS via the native BMS, controllers and devices but controlled via the equipment's proprietary controller and integrated through BACnet, Modbus, Lon Works (or other integrating software) will undergo a similar test as described in the "BMS Controls".

2. The equipment manufacturer's control representative AND the BMS controls representative will be present to demonstrate to the CxA the proper annunciation of all readable points and control of all writable points (setpoints and/or control devices).
3. The equipment manufacturer's control representative AND the BMS controls representative will be present to demonstrate all of the sequences of operations residing in the manufacturer's control panel AND the BMS software (as required by the sequence of operations).
4. All setpoints, alarm outputs and other information residing in or generated by the local control panel will be documented by the equipment manufacturer in the start-up report and turned over to the CxA prior to demonstrating the equipment operation. The BMS contractor will provide a username and password to the CxA with appropriate read/write privileges.

G. Water to Water Heat Pumps

1. The installer(s) will be required to demonstrate all safeties (personnel and mechanical e.g. low flow/loss of flow); local device operation; and any integrated 3rd party Building Management System controls, including all related devices and sequences of operation.
2. Any local equipment controls for the heat pump modules will require the representative who was responsible for the programming and setting up of the equipment to document the set points, alarms, integration with the BMS, and demonstrate the performance of their equipment.
3. The manufacturer’s representative will be required to verify all system electrical circuitry, compressor motor rotation and lubrication, and to verify that all system units and components are free from defects and damage. In addition any field adjustable switches and circuit breaker ranges should be set, and all setpoints should be properly adjusted. All shipping bolts, blocks or straps should be removed, and all required labels should be installed and visible.
4. The following operational sequences, equipment, devices, and systems will also be demonstrated for proper operation to the CxA:

    a. Peak and low load condition operation.
    b. Heat pump module staging.
    c. Supply water temperature control.
    d. Differential pressure and/or flow control for the hot, chilled, and ground source water.

H. Terminal Equipment - VAVs

1. The variable air volume boxes will be tested to verify the proper air flows are programmed and achieving the different modes of operation. Initial air flow verifications will be performed at the BMS only after the balancing is completed and all VAV flow stations have been calibrated by the TAB contractor. Adjustments to the air flows may need to be made by the BMS contractor to achieve the required air flows and balancing.
2. Reheats will be tested to verify the proper operation associated with the temperature control within the space. These tests will be performed at the BMS using the reheat discharge air temperature and the mapping will be verified in the spaces and at the BMS.
3. A full flow air test will be performed under design conditions to determine if all if the VAV's are capable of achieving their design airflow. This will be performed after initial VAV operational tests by the CxA.

I. BMS Controls

1. The BMS contractor will be required to demonstrate that all specified hardware and software has been provided; graphical user interfaces are complete, displaying current data that updates and refreshes within the times listed in the specification; all specified network connections (e.g. to the internet/LAN/WAN) are established; login and system security is set up; utilities for alarming (local and remote), scheduling, reporting, trending, graphic templates/editing capability are programmed and complete.
2. The BMS contractor will be required to verify and certify in writing that all input and output points are operating properly, calibrated and annunciate properly on the BMS.
3. The BMS contractor will be required to verify and certify in writing that all sequences of operations that were programmed by the BMS contractor are operating as per the design intent. The demonstration of these sequences will be performed at least once by the installing contractor as part of their independent commissioning process and then in the presence of the CxA, as directed by the CxA.
4. All reports, alarms and graphics must be fully completed and certified, in writing by the installing contractor, that these items are completed and have been verified by the installing contractor. This includes, but is not limited to:
5. a. All system graphics including BACnet, Lon or ModBus interfaces.
6. b. Alarms including setpoints, graphical annunciation, cell phone annunciation, email annunciation, etc.
7. c. Trending of any point defined by the CxA.
8. All alarms. Any alarm that is to be annunciated will include the appropriate text describing the alarm. System code or any other code that is not immediately intuitive to the system operator is not acceptable. The owner will not be responsible for programming or developing any text for the annunciation of the alarms on any device. This includes local panels, BMS interface or remote wireless annunciation or notification.
9. The CxA will perform a point-to-point verification of all digital outputs, digital inputs, analog outputs, analog inputs, universal inputs and universal outputs. The controls representative is required to be present during this testing.
10. The CxA will test all sequences of operations for selected equipment. The controls representative is required to be present during this testing.
11. The BMS contractor will provide a username and password to the CxA with appropriate read/write privileges.Glycol Make-Up Pump

J. Glycol Make-Up Pump

1. The glycol water make up systems will be tested and verified for proper make-up operation, pressure regulation, glycol concentration and alarm feedback to the BMS.
2. The water meter will be tested for accuracy and feedback to the BMS.

K. Ductless Split System

1. The start-up report will be submitted to the CxA prior to testing.
2. The CxA will measure the DAT and compare it to RAT to verify coil performance.
3. Integration with the BMS including control and operation, and alarms will be verified.
4. For air cooled condensers, if a low ambient kit is required by the equipment specifications or by the manufacturer, the contractor will be responsible for demonstrating the operation of the unit regardless of the season it is commissioned.

L. Unit Heaters

1. All sequence of operations pertaining to the CUHs will be tested including start/stop, temperature control and fan operation.
2. Any local controls will be verified and setpoints recorded including space thermostats and fan cut-outs (aqua-stats).

3. Temperatures of the unit heater's coil will be taken by the CxA to verify performance.

END OF SECTION 23 08 00

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SECTION 230900 - INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.

B. Related Sections include the following:

1. Division 23 Section "Meters and Gages for HVAC Piping" for measuring equipment that relates to this Section.
2. Division 23 Section "Sequence of Operations for HVAC Controls" for requirements that relate to this Section.

1.3 DEFINITIONS

A. BACnet: A data communication protocol for building automation and control networks.

B. DDC: Direct digital control.

C. I/O: Input/output.

D. MS/TP: Master slave/token passing.

E. PC: Personal computer.

F. PID: Proportional plus integral plus derivative.

G. RTD: Resistance temperature detector.

1.4 SYSTEM PERFORMANCE

A. Comply with the following performance requirements:

1. Acceptable controls manufacturer's.
   a. Siemens (Basis of Design)
   b. Automated Logic
   c. Carrier

2. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 10 seconds.
3. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 8 seconds.
4. Object Command: Reaction time of less than two seconds between operator command of a binary object and device reaction.
5. Object Scan: Transmit change of state and change of analog values to control units or workstation within six seconds.
6. Alarm Response Time: Annunciate alarm at workstation within 45 seconds. Multiple workstations must receive alarms within five seconds of each other.
7. Program Execution Frequency: Run capability of applications as often as five seconds, but selected consistent with mechanical process under control.
8. Performance: Programmable controllers shall execute DDC PID control loops, and scan and update process values and outputs at least once per second.
9. Reporting Accuracy and Stability of Control: Report values and maintain measured variables within tolerances as follows:
   a. Water Temperature: Plus or minus 1 deg F (0.5 deg C).
   b. Water Flow: Plus or minus 5 percent of full scale.
   c. Water Pressure: Plus or minus 2 percent of full scale.
   d. Space Temperature: Plus or minus 1 deg F (0.5 deg C).
   e. Ducted Air Temperature: Plus or minus 1 deg F (0.5 deg C).
   f. Outside Air Temperature: Plus or minus 2 deg F (1.0 deg C).
   g. Dew Point Temperature: Plus or minus 3 deg F (1.5 deg C).
   h. Temperature Differential: Plus or minus 0.25 deg F (0.15 deg C).
   i. Relative Humidity: Plus or minus 5 percent.
   j. Airflow (Pressurized Spaces): Plus or minus 3 percent of full scale.
   k. Airflow (Measuring Stations): Plus or minus 5 percent of full scale.
   l. Airflow (Terminal): Plus or minus 10 percent of full scale.
   m. Air Pressure (Space): Plus or minus 0.01-inch wg (2.5 Pa).
   n. Air Pressure (Ducts): Plus or minus 0.1-inch wg (25 Pa).
   o. Carbon Monoxide: Plus or minus 5 percent of reading.
   p. Carbon Dioxide: Plus or minus 50 ppm.
   q. Electrical: Plus or minus 5 percent of reading.

1.5 SEQUENCE OF OPERATION

A. Refer to control drawings H-501 through H-504 for equipment sequence of operations and points list's.

1.6 SUBMITTALS

A. Product Data: Include manufacturer's technical literature for each control device. Indicate dimensions, capacities, performance characteristics, electrical characteristics, finishes for materials, and installation and startup instructions for each type of product indicated.

1. DDC System Hardware: Bill of materials of equipment indicating quantity, manufacturer, and model number. Include technical data for operator workstation equipment, interface equipment, control units, transducers/transmitters, sensors, actuators, valves, relays/switches, control panels, and operator interface equipment.
2. Control System Software: Include technical data for operating system software, operator interface, color graphics, and other third-party applications.

3. Controlled Systems: Instrumentation list with element name, type of device, manufacturer, model number, and product data. Include written description of sequence of operation including schematic diagram.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Bill of materials of equipment indicating quantity, manufacturer, and model number.
2. Schematic flow diagrams showing fans, pumps, coils, dampers, valves, and control devices.
3. Wiring Diagrams: Power, signal, and control wiring.
4. Details of control panel faces, including controls, instruments, and labeling.
5. Written description of sequence of operation.
6. Schedule of dampers including size, leakage, and flow characteristics.
7. Schedule of valves including flow characteristics.
8. DDC System Hardware:
   a. Wiring diagrams for control units with termination numbers.
   b. Schematic diagrams and floor plans for field sensors and control hardware.
   c. Schematic diagrams for control, communication, and power wiring, showing trunk data conductors and wiring between operator workstation and control unit locations.
9. Control System Software: List of color graphics indicating monitored systems, data (connected and calculated) point addresses, output schedule, and operator notations.
10. Controlled Systems:
    a. Schematic diagrams of each controlled system with control points labeled and control elements graphically shown, with wiring.
    b. Scaled drawings showing mounting, routing, and wiring of elements including bases and special construction.
    c. Written description of sequence of operation including schematic diagram.
    d. Points list.

C. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with ASHRAE 135.

D. Data Communications Protocol Certificates: Certify that each proposed DDC system component complies with BACNet.

E. Samples for Initial Selection: For each color required, of each type of thermostat or sensor cover with factory-applied color finishes.

F. Samples for Verification: For each color required, of each type of thermostat or sensor cover.

G. Software and Firmware Operational Documentation: Include the following:

1. Software operating and upgrade manuals.
2. Program Software Backup: On a magnetic media or compact disc, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.
5. Software license required by and installed for DDC workstations and control systems.

H. Software Upgrade Kit: For Owner to use in modifying software to suit future systems revisions or monitoring and control revisions.

I. Qualification Data: For Installer and manufacturer.

J. Field quality-control test reports.

K. Operation and Maintenance Data: For HVAC instrumentation and control system to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Maintenance instructions and lists of spare parts for each type of control device and compressed-air station.
2. Interconnection wiring diagrams with identified and numbered system components and devices.
3. Keyboard illustrations and step-by-step procedures indexed for each operator function.
4. Inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
5. Calibration records and list of set points.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Automatic control system manufacturer's authorized representative who is trained and approved for installation of system components required for this Project.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with ASHRAE 135 for DDC system components.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Factory-Mounted Components: Where control devices specified in this Section are indicated to be factory mounted on equipment, arrange for shipping of control devices to equipment manufacturer.

B. System Software: Update to latest version of software at Project completion.

1.9 COORDINATION

A. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation.

B. Coordinate equipment with Division 28 Section "Intrusion Detection" to achieve compatibility with equipment that interfaces with that system and with building master clock.

C. Coordinate equipment with Division 28 Section "Access Control" to achieve compatibility with equipment that interfaces with that system.

D. Coordinate equipment with Division 27 Section "Clock Systems" to achieve compatibility with equipment that interfaces with that system.

E. Coordinate equipment with Division 28 Section "PLC Electronic Detention Monitoring and Control Systems" to achieve compatibility with equipment that interfaces with that system.

F. Coordinate equipment with Division 26 Section "Network Lighting Controls" to achieve compatibility with equipment that interfaces with that system.

G. Coordinate equipment with Division 28 Section "Fire Detection and Alarm" to achieve compatibility with equipment that interfaces with that system.

H. Coordinate supply of conditioned electrical branch circuits for control units and operator workstation.

I. Coordinate equipment with Division 26 Section "Electrical Power Monitoring and Control" to achieve compatibility of communication interfaces.

J. Coordinate equipment with Division 26 Section "Panelboards" to achieve compatibility with starter coils and annunciation devices.

K. Coordinate equipment with Division 26 Section "Motor-Control Centers" to achieve compatibility with motor starters and annunciation devices.

L. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03 Section "Cast-in-Place Concrete."

1.10 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Replacement Materials: One replacement diaphragm or relay mechanism for each unique controller, thermostat and positioning relay.
2. Maintenance Materials: One thermostat adjusting key(s).

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by the one manufacturer specified in section 2.2.A.1.

2.2 CONTROL SYSTEM

A. Manufacturers:
   1. Siemens Building Technologies, Inc.

B. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories to control mechanical systems.

C. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, accessories, and software connected to distributed controllers operating in multiuser, multitasking environment on token-passing network and programmed to control mechanical systems. An operator workstation permits interface with the network via dynamic color graphics with each mechanical system, building floor plan, and control device depicted by point-and-click graphics.

D. Control system shall include the following:

   1. Building intrusion detection system specified in Division 28 Section "Intrusion Detection."
   2. Building clock control system specified in Division 27 Section "Clock Systems."
   3. Building lighting control system specified in Division 26 Section "Network Lighting Controls."
   4. Fire alarm system specified in Division 28 Section "Fire Detection and Alarm."

2.3 DDC EQUIPMENT

A. Control Units: Modular, comprising processor board with programmable, nonvolatile, random-access memory; local operator access and display panel; integral interface equipment; and backup power source.

   1. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator workstation or diagnostic terminal unit.
   2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
      a. Global communications.
      b. Discrete/digital, analog, and pulse I/O.
      c. Monitoring, controlling, or addressing data points.
      d. Software applications, scheduling, and alarm processing.
      e. Testing and developing control algorithms without disrupting field hardware and controlled environment.
   3. Standard Application Programs:
      a. Electric Control Programs: Demand limiting, duty cycling, automatic time scheduling, start/stop time optimization, night setback/setup, on-off control with differential sequencing, staggered start, antishort cycling, PID control, DDC with fine tuning, and trend logging.
      b. HVAC Control Programs: Optimal run time, supply-air reset, and enthalpy switchover.
      c. Chiller Control Programs: Control function of condenser-water reset, chilled-water reset, and equipment sequencing.
      d. Programming Application Features: Include trend point; alarm processing and messaging; weekly, monthly, and annual scheduling; energy calculations; run-time totalization; and security access.

e. Remote communications.
f. Maintenance management.
g. Units of Measure: Inch-pound and SI (metric).

4. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.
5. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.
6. BACnet Compliance: Control units shall use BACnet communications through IP protocol.

B. Local Control Units: Modular, comprising processor board with electronically programmable, nonvolatile, read-only memory; and backup power source.

1. Units monitor or control each I/O point, process information, and download from or upload to operator workstation or diagnostic terminal unit.
2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
   a. Global communications.
   b. Discrete/digital, analog, and pulse I/O.
   c. Monitoring, controlling, or addressing data points.
3. Local operator interface provides for download from or upload to operator workstation or diagnostic terminal unit.
4. ASHRAE 135 Compliance: Control units shall use ASHRAE 135 protocol and communicate using ISO 8802-3 (Ethernet) datalink/physical layer protocol.
5. BACnet Compliance: Control units shall use BACnet communications through IP protocol.

C. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.

1. Binary Inputs: Allow monitoring of on-off signals without external power.
2. Pulse Accumulation Inputs: Accept up to 10 pulses per second.
3. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.
4. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation.
5. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA).
6. Tri-State Outputs: Provide two coordinated binary outputs for control of three-point, floating-type electronic actuators.
7. Universal I/Os: Provide software selectable binary or analog outputs.

D. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall match output current and voltage requirements and be full-wave rectifier type with the following:

1. Output ripple of 5.0 mV maximum peak to peak.
2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.
3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.

E. Power Line Filtering: Internal or external transient voltage and surge suppression for workstations or controllers with the following:

1. Minimum dielectric strength of 1000 V.
2. Maximum response time of 10 nanoseconds.
3. Minimum transverse-mode noise attenuation of 65 dB.
4. Minimum common-mode noise attenuation of 150 dB at 40 to 100 Hz.

2.4 UNITARY CONTROLLERS

A. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application.

1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and 72-hour battery backup.
2. Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms. Perform scheduling with real-time clock. Perform automatic system diagnostics; monitor system and report failures.
3. ASHRAE 135 Compliance: Communicate using read (execute and initiate) and write (execute and initiate) property services defined in ASHRAE 135. Reside on network using MS/TP datalink/physical layer protocol and have service communication port for connection to diagnostic terminal unit.
4. BACnet Compliance: Control units shall use BACnet communications through IP protocol.
5. Enclosure: Dustproof rated for operation at 32 to 120 deg F (0 to 50 deg C).
6. Enclosure: Waterproof rated for operation at 40 to 150 deg F (5 to 65 deg C).

2.5 ALARM PANELS

A. Unitized cabinet with suitable brackets for wall or floor mounting. Fabricate of 0.06-inch- (1.5-mm-) thick, furniture-quality steel or extruded-aluminum alloy, totally enclosed, with hinged doors and keyed lock and with manufacturer's standard shop-painted finish. Provide common keying for all panels.

B. Indicating light for each alarm point, single horn, acknowledge switch, and test switch, mounted on hinged cover.

1. Alarm Condition: Indicating light flashes and horn sounds.
2. Acknowledge Switch: Horn is silent and indicating light is steady.
3. Second Alarm: Horn sounds and indicating light is steady.
4. Alarm Condition Cleared: System is reset and indicating light is extinguished.
5. Contacts in alarm panel allow remote monitoring by independent alarm company.

2.6 ANALOG CONTROLLERS

A. Step Controllers: 6- or 10-stage type, with heavy-duty switching rated to handle loads and operated by electric motor.

B. Electric, Outdoor-Reset Controllers: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range, adjustable set point, scale range minus 10 to plus 70 deg F (minus 23 to plus 21 deg C), and single- or double-pole contacts.

C. Electronic Controllers: Wheatstone-bridge-amplifier type, in steel enclosure with provision for remote-resistance readjustment. Identify adjustments on controllers, including proportional band and authority.

1. Single controllers can be integral with control motor if provided with accessible control readjustment potentiometer.

D. Fan-Speed Controllers: Solid-state model providing field-adjustable proportional control of motor speed from maximum to minimum of 55 percent and on-off action below minimum fan speed. Controller shall briefly apply full voltage, when motor is started, to rapidly bring motor up to minimum speed. Equip with filtered circuit to eliminate radio interference.

E. Receiver Controllers: Single- or multiple-input models with control-point adjustment, direct or reverse acting with mechanical set-point adjustment with locking device, proportional band adjustment, authority adjustment, and proportional control mode.

1. Remote-control-point adjustment shall be plus or minus 20 percent of sensor span, input signal of 3 to 13 psig (21 to 90 kPa).
2. Proportional band shall extend from 2 to 20 percent for 5 psig (35 kPa).
3. Authority shall be 20 to 200 percent.
4. Air-supply pressure of 18 psig (124 kPa), input signal of 3 to 15 psig (21 to 103 kPa), and output signal of zero to supply pressure.
5. Gages: 2-1/2 inches (64 mm) in diameter, 2.5 percent wide-scale accuracy, and range to match transmitter input or output pressure.

2.7 TIME CLOCKS

A. Manufacturers:

1. ATC-Diversified Electronics.
2. Grasslin Controls Corporation.
3. Paragon Electric Co., Inc.
4. Precision Multiple Controls, Inc.
5. SSAC Inc.; ABB USA.
6. TCS/Basys Controls.
7. Theben AG - Lumilite Control Technology, Inc.
8. Time Mark Corporation.

B. Seven-day, programming-switch timer with synchronous-timing motor and seven-day dial; continuously charged, nickel-cadmium-battery-driven, eight-hour, power-failure carryover; multiple-switch trippers; minimum of two and maximum of eight signals per day with two normally open and two normally closed output contacts.

C. Solid-state, programmable time control with 8 separate programs each with up to 100 on-off operations; 1-second resolution; lithium battery backup; keyboard interface and manual override; individual on-off-auto switches for each program; 365-day calendar with 20 programmable holidays; choice of fail-safe operation for each program; system fault alarm; and communications package allowing networking of time controls and programming from PC.

2.8 ELECTRONIC SENSORS

A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.

B. Thermistor Temperature Sensors and Transmitters:

1. Manufacturers:
   a. BEC Controls Corporation.
   b. Ebtron, Inc.
   c. Heat-Timer Corporation.
   d. I.T.M. Instruments Inc.
   e. MAMAC Systems, Inc.
   f. RDF Corporation.
2. Accuracy: Plus or minus 0.5 deg F (0.3 deg C) at calibration point.
3. Wire: Twisted, shielded-pair cable.
4. Insertion Elements in Ducts: Single point, 8 inches (200 mm) long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft. (0.84 sq. m).
5. Averaging Elements in Ducts: 36 inches (915 mm) long, flexible; use where prone to temperature stratification or where ducts are larger than 10 sq. ft. (1 sq. m).
6. Insertion Elements for Liquids: Brass or stainless-steel socket with minimum insertion length of 2-1/2 inches (64 mm).
7. Room Sensor Cover Construction: Manufacturer's standard locking covers.
   a. Set-Point Adjustment: Exposed.
   b. Set-Point Indication: Exposed.
   c. Thermometer: Concealed.
   d. Color: White
   e. Orientation: Vertical.
8. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
9. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.

C. RTDs and Transmitters:

1. Manufacturers:
   a. BEC Controls Corporation.
   b. MAMAC Systems, Inc.
   c. RDF Corporation.
2. Accuracy: Plus or minus 0.2 percent at calibration point.
3. Wire: Twisted, shielded-pair cable.
4. Insertion Elements in Ducts: Single point, 8 inches (200 mm) long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft. (0.84 sq. m).
5. Averaging Elements in Ducts: 18 inches (460 mm) long, rigid; use where prone to temperature stratification or where ducts are larger than 9 sq. ft. (0.84 sq. m); length as required.
6. Insertion Elements for Liquids: Brass socket with minimum insertion length of 2-1/2 inches (64 mm).
7. Room Sensor Cover Construction: Manufacturer's standard locking covers.
   a. Set-Point Adjustment: Exposed.
   b. Set-Point Indication: Exposed.
   c. Thermometer: Concealed.

d. Color: White
e. Orientation: Vertical.

8. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
9. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.

D. Humidity Sensors: Bulk polymer sensor element.

1. Manufacturers:
   a. BEC Controls Corporation.
   b. General Eastern Instruments.
   c. MAMAC Systems, Inc.
   d. ROTRONIC Instrument Corp.
   e. TCS/Basys Controls.
   f. Vaisala.
2. Accuracy: 2 percent full range with linear output.
3. Room Sensor Range: 20 to 80 percent relative humidity.
4. Room Sensor Cover Construction: Manufacturer's standard locking covers.
   a. Set-Point Adjustment: Concealed.
   b. Set-Point Indication: Concealed.
   c. Thermometer: Concealed.
5. Duct Sensor: 20 to 80 percent relative humidity range with element guard and mounting plate.
6. Outside-Air Sensor: 20 to 80 percent relative humidity range with mounting enclosure, suitable for operation at outdoor temperatures of minus 22 to plus 185 deg F (minus 30 to plus 85 deg C).
7. Duct and Sensors: With element guard and mounting plate, range of 0 to 100 percent relative humidity.

E. Pressure Transmitters/Transducers:

1. Manufacturers:
   a. BEC Controls Corporation.
   b. General Eastern Instruments.
   c. MAMAC Systems, Inc.
   d. ROTRONIC Instrument Corp.
   e. TCS/Basys Controls.
   f. Vaisala.
2. Static-Pressure Transmitter: Nondirectional sensor with suitable range for expected input, and temperature compensated.
   a. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
   b. Output: 4 to 20 mA.
   c. Building Static-Pressure Range: 0- to 0.25-inch wg (0 to 62 Pa).
   d. Duct Static-Pressure Range: 0- to 5-inch wg (0 to 1240 Pa).
3. Water Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig (1034-kPa) operating pressure; linear output 4 to 20 mA.
4. Water Differential-Pressure Transducers: Stainless-steel diaphragm construction, suitable for service; minimum 150-psig (1034-kPa) operating pressure and tested to 300-psig (2070-kPa); linear output 4 to 20 mA.
5. Differential-Pressure Switch (Air or Water): Snap acting, with pilot-duty rating and with suitable scale range and differential.
6. Pressure Transmitters: Direct acting for gas, liquid, or steam service; range suitable for system; linear output 4 to 20 mA.

F. Room Sensor Cover Construction: Manufacturer's standard locking covers.

a. Set-Point Adjustment: Exposed.
b. Set-Point Indication: Exposed.
c. Thermometer: Concealed.
d. Color: White
e. Orientation: Vertical

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G. Room sensor accessories include the following:

1. Insulating Bases: For sensors located on exterior walls.
2. Guards: Locking; heavy-duty, transparent plastic; mounted on separate base
3. Adjusting Key: As required for calibration and cover screws.

2.9 STATUS SENSORS

A. Status Inputs for Fans: Differential-pressure switch with pilot-duty rating and with adjustable range of 0- to 5-inch wg (0 to 1240 Pa).

B. Status Inputs for Pumps: Differential-pressure switch with pilot-duty rating and with adjustable pressure-differential range of 8 to 60 psig (55 to 414 kPa), piped across pump.

C. Status Inputs for Electric Motors: Comply with ISA 50.00.01, current-sensing fixed- or split-core transformers with self-powered transmitter, adjustable and suitable for 175 percent of rated motor current.

D. Voltage Transmitter (100- to 600-V ac): Comply with ISA 50.00.01, single-loop, self-powered transmitter, adjustable, with suitable range and 1 percent full-scale accuracy.

E. Power Monitor: 3-phase type with disconnect/shorting switch assembly, listed voltage and current transformers, with pulse kilowatt hour output and 4- to 20-mA kW output, with maximum 2 percent error at 1.0 power factor and 2.5 percent error at 0.5 power factor.

F. Current Switches: Self-powered, solid-state with adjustable trip current, selected to match current and system output requirements.

G. Electronic Valve/Damper Position Indicator: Visual scale indicating percent of travel and 2- to 10-V dc, feedback signal.

H. Water-Flow Switches: Bellows-actuated mercury or snap-acting type with pilot-duty rating, stainless-steel or bronze paddle, with appropriate range and differential adjustment, in NEMA 250, Type 1 enclosure.

1. Manufacturers:
a. BEC Controls Corporation.
b. I.T.M. Instruments Inc.

2.10 GAS DETECTION EQUIPMENT

A. Manufacturers:

1. B. W. Technologies.
2. CEA Instruments, Inc.
3. Ebtron, Inc.
4. Gems Sensors Inc.
5. Greystone Energy Systems Inc.
6. Honeywell International Inc.; Home & Building Control.
7. INTEC Controls, Inc.
8. I.T.M. Instruments Inc.
9. MSA Canada Inc.
10. QEL/Quatrosense Environmental Limited.
11. Sauter Controls Corporation.
12. Sensidyne, Inc.
13. TSI Incorporated.
14. Vaisala.
15. Vulcain Inc.

B. Carbon Monoxide Detectors: Single or multichannel, dual-level detectors using solid-state plug-in sensors with a 3-year minimum life; suitable over a temperature range of 32 to 104 deg F (0 to 40 deg C); with 2 factory-calibrated alarm levels at 50 and 100 ppm.

C. Carbon Dioxide Sensor and Transmitter: Single detectors using solid-state infrared sensors; suitable over a temperature range of 23 to 130 deg F (minus 5 to plus 55 deg C) and calibrated for 0 to 2 percent, with continuous or averaged reading, 4- to 20-mA output;, for wall mounting.

D. Oxygen Sensor and Transmitter: Single detectors using solid-state zircon cell sensing; suitable over a temperature range of minus 32 to plus 1100 deg F (0 to 593 deg C) and calibrated for 0 to 5 percent, with continuous or averaged reading, 4- to 20-mA output; for wall mounting.

E. Occupancy Sensor: Passive infrared, with time delay, daylight sensor lockout, sensitivity control, and 180-degree field of view with vertical sensing adjustment; for flush mounting.

2.11 REFRIGERANT SENSORS

A. Manufacturers:
1. Macurco (Basis of Design)
2. MSA / Bacharach
3. Ornicom

B. Refrigerant Detectors: Single detectors using Non-dispersive infrared (NDIR) sensors; suitable over a temperature range of 14 to 122 deg F (minus 10 to plus 50 deg C) and calibrated for 0 to 100 percent LEL, with continuous or averaged reading, 4- to 20-mA output;, for wall mounting.

2.12 THERMOSTATS

A. Manufacturers:

1. Erie Controls.
2. Danfoss Inc.; Air-Conditioning and Refrigeration Div.
3. Heat-Timer Corporation.
4. Sauter Controls Corporation.
5. tekmar Control Systems, Inc.

6. Theben AG - Lumilite Control Technology, Inc.

B. Combination Thermostat and Fan Switches: Line-voltage thermostat with push-button or lever-operated fan switch.

1. Label switches "FAN ON-OFF".
2. Mount on single electric switch box.

C. Electric, solid-state, microcomputer-based room thermostat with remote sensor.

1. Automatic switching from heating to cooling.
2. Preferential rate control to minimize overshoot and deviation from set point.
3. Set up for four separate temperatures per day.
4. Instant override of set point for continuous or timed period from 1 hour to 31 days.
5. Short-cycle protection.
6. Programming based on every day of week.
7. Selection features include degree F or degree C display, 12- or 24-hour clock, keyboard disable, remote sensor, and fan on-auto.
8. Battery replacement without program loss.
9. Thermostat display features include the following:
   a. Time of day.
   b. Actual room temperature.
   c. Programmed temperature.
   d. Programmed time.
   e. Duration of timed override.
   f. Day of week.
   g. System mode indications include "heating," "off," "fan auto," and "fan on."

D. Low-Voltage, On-Off Thermostats: NEMA DC 3, 24-V, bimetal-operated, mercury-switch type, with adjustable or fixed anticipation heater, concealed set-point adjustment, 55 to 85 deg F (13 to 30 deg C) set-point range, and 2 deg F (1 deg C) maximum differential.

E. Line-Voltage, On-Off Thermostats: Bimetal-actuated, open contact or bellows-actuated, enclosed, snap-switch or equivalent solid-state type, with heat anticipator; listed for electrical rating; with concealed set-point adjustment, 55 to 85 deg F (13 to 30 deg C) set-point range, and 2 deg F (1 deg C) maximum differential.

1. Electric Heating Thermostats: Equip with off position on dial wired to break ungrounded conductors.
2. Selector Switch: Integral, manual on-off-auto.

F. Remote-Bulb Thermostats: On-off or modulating type, liquid filled to compensate for changes in ambient temperature; with copper capillary and bulb, unless otherwise indicated.

1. Bulbs in water lines with separate wells of same material as bulb.
2. Bulbs in air ducts with flanges and shields.
3. Averaging Elements: Copper tubing with either single- or multiple-unit elements, extended to cover full width of duct or unit; adequately supported.
4. Scale settings and differential settings are clearly visible and adjustable from front of instrument.
5. On-Off Thermostat: With precision snap switches and with electrical ratings required by application.

6. Modulating Thermostats: Construct so complete potentiometer coil and wiper assembly is removable for inspection or replacement without disturbing calibration of instrument.

G. Electric, Low-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual or automatic-reset switch that trips if temperature sensed across any 12 inches (300 mm) of bulb length is equal to or below set point.

1. Bulb Length: Minimum 20 feet (6 m).
2. Quantity: One thermostat for every 20 sq. ft. (2 sq. m) of coil surface.

H. Electric, High-Limit Duct Thermostat: Snap-acting, single-pole, single-throw, manual- or automatic-reset switch that trips if temperature sensed across any 12 inches (300 mm) of bulb length is equal to or above set point.

1. Bulb Length: Minimum 20 feet (6 m).
2. Quantity: One thermostat for every 20 sq. ft. (2 sq. m) of coil surface.

I. Heating/Cooling Valve-Top Thermostats: Proportional acting for proportional flow, with molded-rubber diaphragm, remote-bulb liquid-filled element, direct and reverse acting at minimum shutoff pressure of 25 psig (172 kPa), and cast housing with position indicator and adjusting knob.

2.13 HUMIDISTATS

A. Manufacturers:

1. MAMAC Systems, Inc.
2. ROTRONIC Instrument Corp.

B. Duct-Mounting Humidistats: Electric insertion, 2-position type with adjustable, 2 percent throttling range, 20 to 80 percent operating range, and single- or double-pole contacts.

2.14 ACTUATORS

A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.

1. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
2. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
3. Nonspring-Return Motors for Valves Larger Than NPS 2-1/2 (DN 65): Size for running torque of 150 in. x lbf (16.9 N x m) and breakaway torque of 300 in. x lbf (33.9 N x m).
4. Spring-Return Motors for Valves Larger Than NPS 2-1/2 (DN 65): Size for running and breakaway torque of 150 in. x lbf (16.9 N x m).
5. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft. (2.3 sq. m): Size for running torque of 150 in. x lbf (16.9 N x m) and breakaway torque of 300 in. x lbf (33.9 N x m).

6. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft. (2.3 sq. m): Size for running and breakaway torque of 150 in. x lbf (16.9 N x m).

B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.

1. Manufacturers:

   a. Belimo Aircontrols (USA), Inc.

2. Valves: Size for torque required for valve close off at maximum pump differential pressure.
3. Dampers: Size for running torque calculated as follows:
   a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. (86.8 kg-cm/sq. m) of damper.
   b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. (62 kg-cm/sq. m) of damper.
   c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft (49.6 kg-cm/sq. m) of damper.
   d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. (37.2 kg-cm/sq. m) of damper.
   e. Dampers with 2- to 3-Inch wg (500 to 750 Pa) of Pressure Drop or Face Velocities of 1000 to 2500 fpm (5 to 13 m/s): Increase running torque by 1.5.
   f. Dampers with 3- to 4-Inch wg (750 to 1000 Pa) of Pressure Drop or Face Velocities of 2500 to 3000 fpm (13 to 15 m/s): Increase running torque by 2.0.
4. Coupling: V-bolt and V-shaped, toothed cradle.
5. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
6. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.
7. Power Requirements (Two-Position Spring Return): 24-V ac.
8. Power Requirements (Modulating): Maximum 10 VA at 24-V ac or 8 W at 24-V dc.
9. Proportional Signal: 2- to 10-V dc or 4 to 20 mA, and 2- to 10-V dc position feedback signal.
10. Temperature Rating: Minus 22 to plus 122 deg F (Minus 30 to plus 50 deg C).
11. Temperature Rating (Smoke Dampers): Minus 22 to plus 250 deg F (Minus 30 to plus 121 deg C).

2.15 CONTROL VALVES

A. Manufacturers:

1. Danfoss Inc.; Air Conditioning & Refrigeration Div.
2. Erie Controls.
3. Hayward Industrial Products, Inc.
4. Magnatrol Valve Corporation.
5. Neles-Jamesbury.
6. Parker Hannifin Corporation; Skinner Valve Division.
7. Pneuline Controls.
8. Sauter Controls Corporation.

B. Control Valves: Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.

C. Hydronic system globe valves shall have the following characteristics:

1. NPS 2 (DN 50) and Smaller: Class 125 bronze body, bronze trim, rising stem, renewable composition disc, and screwed ends with backseating capacity repackable under pressure.
2. NPS 2-1/2 (DN 65) and Larger: Class 125 iron body, bronze trim, rising stem, plug-type disc, flanged ends, and renewable seat and disc.
3. Internal Construction: Replaceable plugs and stainless-steel or brass seats.
   a. Single-Seated Valves: Cage trim provides seating and guiding surfaces for plug on top and bottom.
   b. Double-Seated Valves: Balanced plug; cage trim provides seating and guiding surfaces for plugs on top and bottom.
4. Sizing: 3-psig (21-kPa) maximum pressure drop at design flow rate or the following:
   a. Two Position: Line size.
   b. Two-Way Modulating: Either the value specified above or twice the load pressure drop, whichever is more.
   c. Three-Way Modulating: Twice the load pressure drop, but not more than value specified above.
5. Flow Characteristics: Two-way valves shall have equal percentage characteristics; three-way valves shall have linear characteristics.
6. Close-Off (Differential) Pressure Rating: Combination of actuator and trim shall provide minimum close-off pressure rating of 150 percent of total system (pump) head for two-way valves and 100 percent of pressure differential across valve or 100 percent of total system (pump) head.

D. Self-Contained Control Valves: Bronze body, bronze trim, two or three ports as indicated, replaceable plugs and seats, and union and threaded ends.

1. Rating: Class 125 for service at 125 psig (860 kPa) and 250 deg F (121 deg C) operating conditions.
2. Thermostatic Operator: Liquid-filled remote sensor with remote adjustable dial.

2.16 DAMPERS

A. Manufacturers:

1. Air Balance Inc.
2. TAMCO (T. A. Morrison & Co. Inc.).
3. United Enertech Corp.

B. Dampers: AMCA-rated, opposed-blade design; 0.108-inch- (2.8-mm-) minimum thick, galvanized-steel or 0.125-inch- (3.2-mm-) minimum thick, extruded-aluminum frames with holes for duct mounting; damper blades shall not be less than 0.064-inch- (1.6-mm-) thick galvanized steel with maximum blade width of 8 inches (200 mm) and length of 48 inches (1220 mm).

1. Secure blades to 1/2-inch- (13-mm-) diameter, zinc-plated axles using zinc-plated hardware, with oil-impregnated sintered bronze blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
2. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).
3. Edge Seals, Standard Pressure Applications: Closed-cell neoprene.

4. Edge Seals, Low-Leakage Applications: Use inflatable blade edging or replaceable rubber blade seals and spring-loaded stainless-steel side seals, rated for leakage at less than 4 cfm per sq. ft. (20 L/s per sq. m) of damper area, at differential pressure of 1-inch wg (250 Pa) when damper is held by torque of 50 in. x lbf (5.6 N x m); when tested according to AMCA 500D.

2.17 CONTROL CABLE

A. Electronic and fiber-optic cables for control wiring are specified in Division 27 Section "Communications Horizontal Cabling."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that conditioned power supply is available to control units and operator workstation.

B. Verify that pneumatic piping and duct-, pipe-, and equipment-mounted devices are installed before proceeding with installation.

3.2 INSTALLATION

A. Install software in control units and operator workstation(s). Implement all features of programs to specified requirements and as appropriate to sequence of operation.

B. Include a full integration of all equipment that come with packaged controls to the system. Refer to controls drawings H-501 through H-504.

C. Connect and configure equipment and software to achieve sequence of operation specified.

D. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install devices 60 inches (1530 mm) above the floor.

1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.

E. Install guards on thermostats in the following locations:

1. Entrances.
2. Public areas.
3. Where indicated.

F. Install automatic dampers according to Division 23 Section "Air Duct Accessories."

G. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.

H. Install labels and nameplates to identify control components according to Division 23 Section "Identification for HVAC Piping and Equipment."

I. Install hydronic instrument wells, valves, and other accessories according to Division 23 Section "Hydronic Piping."

J. Install refrigerant instrument wells, valves, and other accessories according to Division 23 Section "Refrigerant Piping."

K. Install duct volume-control dampers according to Division 23 Sections specifying air ducts.

L. Install electronic and fiber-optic cables according to Division 27 Section "Communications Horizontal Cabling."

3.3 ELECTRICAL WIRING AND CONNECTION INSTALLATION

A. Install raceways, boxes, and cabinets according to Division 26 Section "Raceway and Boxes for Electrical Systems."

B. Install building wire and cable according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

C. Install signal and communication cable according to Division 27 Section "Communications Horizontal Cabling."

1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
2. Install exposed cable in raceway.
3. Install concealed cable in raceway.
4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
6. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.

E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.

2. Test and adjust controls and safeties.
3. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
4. Pressure test control air piping at 30 psig (207 kPa) or 1.5 times the operating pressure for 24 hours, with maximum 5-psig (35-kPa) loss.
5. Pressure test high-pressure control air piping at 150 psig (1034 kPa) and low-pressure control air piping at 30 psig (207 kPa) for 2 hours, with maximum 1-psig (7-kPa) loss.
6. Test calibration of electronic controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
7. Test each point through its full operating range to verify that safety and operating control set points are as required.
8. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
9. Test each system for compliance with sequence of operation.
10. Test software and hardware interlocks.

C. DDC Verification:

1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
2. Check instruments for proper location and accessibility.
3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
4. Check instrument tubing for proper fittings, slope, material, and support.
5. Check installation of air supply for each instrument.
6. Check flow instruments. Inspect tag number and line and bore size, and verify that inlet side is identified and that meters are installed correctly.
7. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
8. Check temperature instruments and material and length of sensing elements.
9. Check control valves. Verify that they are in correct direction.
10. Check air-operated dampers. Verify that pressure gages are provided and that proper blade alignment, either parallel or opposed, has been provided.
11. Check DDC system as follows:
    a. Verify that DDC controller power supply is from emergency power supply, if applicable.
    b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
    c. Verify that spare I/O capacity has been provided.
    d. Verify that DDC controllers are protected from power supply surges.

D. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

3.5 ADJUSTING

A. Calibrating and Adjusting:

1. Calibrate instruments.
2. Make three-point calibration test for both linearity and accuracy for each analog instrument.
3. Calibrate equipment and procedures using manufacturer's written recommendations and instruction manuals. Use test equipment with accuracy at least double that of instrument being calibrated.

4. Control System Inputs and Outputs:
   a. Check analog inputs at 0, 50, and 100 percent of span.
   b. Check analog outputs using milliampere meter at 0, 50, and 100 percent output.
   c. Check digital inputs using jumper wire.
   d. Check digital outputs using ohmmeter to test for contact making or breaking.
   e. Check resistance temperature inputs at 0, 50, and 100 percent of span using a precision-resistant source.
5. Flow:
   a. Set differential pressure flow transmitters for 0 and 100 percent values with 3-point calibration accomplished at 50, 90, and 100 percent of span.
   b. Manually operate flow switches to verify that they make or break contact.
6. Pressure:
   a. Calibrate pressure transmitters at 0, 50, and 100 percent of span.
   b. Calibrate pressure switches to make or break contacts, with adjustable differential set at minimum.
7. Temperature:
   a. Calibrate resistance temperature transmitters at 0, 50, and 100 percent of span using a precision-resistance source.
   b. Calibrate temperature switches to make or break contacts.
8. Stroke and adjust control valves and dampers without positioners, following the manufacturer's recommended procedure, so that valve or damper is 100 percent open and closed.
9. Stroke and adjust control valves and dampers with positioners, following manufacturer's recommended procedure, so that valve and damper is 0, 50, and 100 percent closed.
10. Provide diagnostic and test instruments for calibration and adjustment of system.
11. Provide written description of procedures and equipment for calibrating each type of instrument. Submit procedures review and approval before initiating startup procedures.

B. Adjust initial temperature and humidity set points.

C. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to three visits to Project during other than normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 230900

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SECTION 23 21 13 - HYDRONIC PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:

1. Hot-water heating piping.
2. Chilled-water piping.
3. Glycol Ground Source-water piping.
4. Condensate-drain piping.
5. Air-vent piping.

B. Related Sections include the following:

1. Division 23 Section "Hydronic Pumps" for pumps, motors, and accessories for hydronic piping.

1.3 DEFINITIONS

A. HDPE: High-Density Polyethylene.

1.4 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:

1. Hot-Water Heating Piping: 200 psig at 200 deg F.
2. Chilled-Water Piping: 200 psig at 200 deg F.
3. Glycol Ground Source -Water Piping: 1,600 psig at 100 deg F.
4. Condensate-Drain Piping: 150 deg F
5. Air-Vent Piping: 200 deg F (93 deg C).
6. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

1.5 SUBMITTALS

A. Product Data: For each type of the following:

1. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
2. Air control devices.
3. Chemical treatment.
4. Hydronic specialties.

B. LEED Submittal:

1. Product Data for Credit EQ 4.1: For solvent cements and adhesive primers, including printed statement of VOC content.

C. Shop Drawings: Detail, at 1/4 (1:50) scale, the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

D. Welding certificates.

E. Qualification Data: For Installer.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For air control devices, hydronic specialties, and special-duty valves to include in emergency, operation, and maintenance manuals.

H. Water Analysis: Submit a copy of the water analysis to illustrate water quality available at Project site.

1.6 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installers of Pressure-Sealed Joints: Installers shall be certified by the pressure-seal joint manufacturer as having been trained and qualified to join piping with pressure-seal pipe couplings and fittings.
2. Fiberglass Pipe and Fitting Installers: Installers of RTRF and RTRP shall be certified by the manufacturer of pipes and fittings as having been trained and qualified to join fiberglass piping with manufacturer-recommended adhesive.

B. Steel Support Welding: Qualify processes and operators according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX.

1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.

D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME

label. Fabricate and stamp air separators and expansion tanks to comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 01.

1.7 EXTRA MATERIALS

A. Water-Treatment Chemicals: Furnish enough chemicals for initial system startup and for preventive maintenance for one year from date of Substantial Completion.

B. Differential Pressure Meter: For each type of balancing valve and automatic flow control valve, include flowmeter, probes, hoses, flow charts, and carrying case.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L (ASTM B 88M, Type B) .

B. DWV Copper Tubing: ASTM B 306, Type DWV.

C. Wrought-Copper Solder Fittings: ASME B16.22 and ASTM B 32, 95-5 tin antimony solder

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings by one of the following:
   a. Anvil International, Inc.
   b. S. P. Fittings; a division of Star Pipe Products.
   c. Victaulic Company of America.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.

B. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in Part 3 "Piping Applications" Article.

C. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article.

D. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

E. Steel Pipe Nipples: ASTM A 733, made of same materials and wall thicknesses as pipe in which they are installed.

2.3 PLASTIC PIPE AND FITTINGS

A. HDPE Plastic Pipe: ASTM D 3035/F 714, geothermal pressure-rated plastic pipe, with factory supplied integral U-Joint.

B. HDPE Plastic Pipe Fittings: ASTM D 3261, heat fused fittings.

2.4 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
   a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
   b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

E. Welding Filler Metals: Comply with AWS D10.12/D10.12M for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

F. Gasket Material: Thickness, material, and type suitable for fluid to be handled and working temperatures and pressures.

2.5 TRANSITION FITTINGS

A. Plastic-to-Metal Transition Fittings:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Creek Plastics
   b. United Poly Systems
   c. WL Plastics
3. One-piece fitting with one flanged steel insert and one HDPE heat fused end.

2.6 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper-alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.

B. Insulating Material: Suitable for system fluid, pressure, and temperature.

C. Dielectric Unions:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Hart Industries International, Inc.
   b. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   c. Zurn Plumbing Products Group; AquaSpec Commercial Products Division.
3. Factory-fabricated union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).

D. Dielectric Nipples:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Precision Plumbing Products, Inc.
   b. Sioux Chief Manufacturing Company, Inc.
   c. Victaulic Company of America.
3. Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

2.7 VALVES

A. Check, Ball, and Butterfly Valves: Comply with requirements specified in Division 23 Section "General-Duty Valves for HVAC Piping."

B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Division 23 Section "Instrumentation and Control for HVAC."

C. Bronze, Calibrated-Orifice, Balancing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provideor a comparable product by one of the following:
   a. Armstrong Pumps, Inc.
   b. Bell & Gossett Domestic Pump; a division of ITT Industries.
   c. Flow Design Inc.

4. Body: Bronze, ball or plug type with calibrated orifice or venturi.
5. Ball: Brass or stainless steel.
6. Plug: Resin.
7. Seat: PTFE.
8. End Connections: Threaded or socket.
9. Pressure Gage Connections: Integral seals for portable differential pressure meter.
10. Handle Style: Lever, with memory stop to retain set position.
11. CWP Rating: Minimum 125 psig (860 kPa).
12. Maximum Operating Temperature: 250 deg F (121 deg C).

D. Cast-Iron or Steel, Calibrated-Orifice, Balancing Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

3. Basis-of-Design Product: Subject to compliance with requirements, provide or a comparable product by one of the following:

   a. Armstrong Pumps, Inc.

   b. Bell & Gossett Domestic Pump; a division of ITT Industries.

   c. Flow Design Inc.

4. Body: Cast-iron or steel body, ball, plug, or globe pattern with calibrated orifice or venturi.
5. Ball: Brass or stainless steel.
6. Stem Seals: EPDM O-rings.
7. Disc: Glass and carbon-filled PTFE.
8. Seat: PTFE.
9. End Connections: Flanged or grooved.
10. Pressure Gage Connections: Integral seals for portable differential pressure meter.
11. Handle Style: Lever, with memory stop to retain set position.
12. CWP Rating: Minimum 125 psig (860 kPa).
13. Maximum Operating Temperature: 250 deg F (121 deg C).

E. Automatic Flow-Control Valves:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
3. Basis-of-Design Product: Subject to compliance with requirements, provide or a comparable product by one of the following:
   a. Flow Design Inc.
   b. Griswold Controls.
   c. Hays Fluid Controls
4. Body: Brass or ferrous metal.

5. Piston and Spring Assembly: Stainless steel, tamper proof, self cleaning, and removable.
6. Combination Assemblies: Include bonze or brass-alloy ball valve.
7. Identification Tag: Marked with zone identification, valve number, and flow rate.
8. Size: Same as pipe in which installed.
9. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
10. Minimum CWP Rating: 175 psig (1207 kPa).
11. Maximum Operating Temperature: 200 deg F (93 deg C).

2.8 AIR CONTROL DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amtrol, Inc.
2. Bell & Gossett Domestic Pump; a division of ITT Industries.
3. Taco.

C. Manual Air Vents:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2 (DN 15).
5. Discharge Connection: NPS 1/8 (DN 6).
6. CWP Rating: 150 psig (1035 kPa).
7. Maximum Operating Temperature: 225 deg F (107 deg C).

D. Expansion Tanks:

1. Tank: Welded steel, rated for 125-psig (860-kPa) working pressure and 375 deg F (191 deg C) maximum operating temperature, with taps in bottom of tank for tank fitting and taps in end of tank for gage glass. Tanks shall be factory tested with taps fabricated and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Air-Control Tank Fitting: Cast-iron body, copper-plated tube, brass vent tube plug, and stainless-steel ball check, 100-gal. (379-L) unit only; sized for compression-tank diameter. Provide tank fittings for 125-psig (860-kPa) working pressure and 250 deg F (121 deg C) maximum operating temperature.
3. Tank Drain Fitting: Brass body, nonferrous internal parts; 125-psig (860-kPa) working pressure and 240 deg F (116 deg C) maximum operating temperature; constructed to admit air to compression tank, drain water, and close off system.
4. Gage Glass: Full height with dual manual shutoff valves, 3/4-inch- (20-mm-) diameter gage glass, and slotted-metal glass guard.

E. Bladder-Type Expansion Tanks:

1. Tank: Welded steel, rated for 125-psig (860-kPa) working pressure and 375 deg F (191 deg C) maximum operating temperature. Factory test with taps fabricated and supports

installed and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Bladder: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.
3. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.

F. In-Line Air Separators:

1. Tank: One-piece cast iron with an integral weir constructed to decelerate system flow to maximize air separation.
2. Maximum Working Pressure: Up to 175 psig (1207 kPa).
3. Maximum Operating Temperature: Up to 300 deg F (149 deg C).

G. Air Purgers:

1. Body: Cast iron with internal baffles that slow the water velocity to separate the air from solution and divert it to the vent for quick removal.
2. Maximum Working Pressure: 150 psig (1035 kPa).
3. Maximum Operating Temperature: 250 deg F (121 deg C).

2.9 CHEMICAL TREATMENT

A. Bypass Chemical Feeder: Welded steel construction; 125-psig (860-kPa) working pressure; 5-gal. (19-L) capacity; with fill funnel and inlet, outlet, and drain valves.

1. Chemicals: Specially formulated, based on analysis of makeup water, to prevent accumulation of scale and corrosion in piping and connected equipment.

B. Propylene Glycol: Industrial grade with corrosion inhibitors and environmental-stabilizer additives for mixing with water in systems indicated to contain antifreeze or glycol solutions.

2.10 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: 60-mesh startup strainer, and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (860 kPa).

B. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch (20-mm) misalignment.
4. CWP Rating: 150 psig (1035 kPa).
5. Maximum Operating Temperature: 250 deg F (121 deg C).

C. Buffer Tanks:
   1. Body: Carbon steel with exterior red oxide primer finish.
   2. End Connections: Flanged.
   3. Performance: 450 gallon volume.
   4. CWP Rating: 150 psig (1035 kPa).
   5. Maximum Operating Temperature: 375 deg F (191 deg C.)

D. Expansion fittings are specified in Division 23 Section "Expansion Fittings and Loops for HVAC Piping."

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Hot-water heating piping, aboveground, NPS 2 (DN 50) and smaller, shall be the following:

   1. Type L (B), drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

B. Hot-water heating piping, aboveground, NPS 2-1/2 (DN 65) and larger, shall be the following:

   1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.

C. Chilled-water piping, aboveground, NPS 2 (DN 50) and smaller, shall be the following:

   1. Type L (B), drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

D. Chilled-water piping, aboveground, NPS 2-1/2 (DN 65) and larger, shall be the following:

   1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.

E. Glycol Ground Source-water piping, aboveground, NPS 2-1/2 (DN 65) and larger, shall be the following:

   1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.

F. A. Glycol Ground Source-water piping, below ground, NPS 2-1/2 (DN 65) and larger, shall be the following
   1. Geothermal HDPE pipe, SDR-9: PE4710: TC: 3.1 single reel pipe, with factory supplied integral U-joints.

G. Glycol Ground Source-water piping, below ground, NPS 2 (DN 50) and smaller, shall be the following:
   1. Geothermal HDPE pipe, SDR-9: PE4710: TC: 3.1 single reel pipe, with factory supplied integral U-joints.

H. Condensate-Drain Piping: Type DWV, drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

I. Air-Vent Piping:
   1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.
   2. Outlet: Type K (A), annealed-temper copper tubing with soldered or flared joints.

J. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.

3.2 VALVE APPLICATIONS

A. Install shutoff-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.

B. Install calibrated-orifice, balancing valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

D. Install check valves at each pump discharge and elsewhere as required to control flow direction.

3.3 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 (DN 20) ball valve, and short NPS 3/4 (DN 20) threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install valves according to Division 23 Section "General-Duty Valves for HVAC Piping."

Q. Install unions in piping, NPS 2 (DN 50) and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

R. Install flanges in piping, NPS 2-1/2 (DN 65) and larger, at final connections of equipment and elsewhere as indicated.

S. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 (DN 20) nipple and ball valve in blowdown connection of strainers NPS 2 (DN 50) and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2 (DN 50).

T. Install expansion loops, expansion joints, anchors, and pipe alignment guides as specified in Division 23 Section "Expansion Fittings and Loops for HVAC Piping."

U. Identify piping as specified in Division 23 Section "Identification for HVAC Piping and Equipment."

V. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

W. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

X. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 23 Section "Escutcheons for HVAC Piping."

3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment." Comply with the following requirements for maximum spacing of supports.

B. Seismic restraints are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

C. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet (6 m) long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet (6 m) or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

D. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 2-1/2 (DN 65): Maximum span, 11 feet (3.4 m); minimum rod size, 3/8 inch (10 mm).
2. NPS 3 (DN 80): Maximum span, 12 feet (3.7 m); minimum rod size, 3/8 inch (10 mm).
3. NPS 4 (DN 100): Maximum span, 14 feet (4.3 m); minimum rod size, 1/2 inch (13 mm).
4. NPS 6 (DN 150): Maximum span, 17 feet (5.2 m); minimum rod size, 1/2 inch (13 mm).

E. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4 (DN 20): Maximum span, 5 feet (1.5 m); minimum rod size, 1/4 inch (6.4 mm).
2. NPS 1 (DN 25): Maximum span, 6 feet (1.8 m); minimum rod size, 1/4 inch (6.4 mm).
3. NPS 1-1/2 (DN 40): Maximum span, 8 feet (2.4 m); minimum rod size, 3/8 inch (10 mm).
4. NPS 2 (DN 50): Maximum span, 8 feet (2.4 m); minimum rod size, 3/8 inch (10 mm).

F. Fiberglass Piping Hanger Spacing: Space hangers according to pipe manufacturer's written instructions for service conditions. Avoid point loading. Space and install hangers with the fewest practical rigid anchor points.

G. Support vertical runs at roof, at each floor, and at 10-foot (3-m) intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Welded Joints: Construct joints according to AWS D10.12/D10.12M, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.6 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install automatic air vents at high points of system piping in mechanical equipment rooms only. Manual vents at heat-transfer coils and elsewhere as required for air venting.

C. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 (DN 50) and larger.

D. Install bypass chemical feeders in each hydronic system where indicated, in upright position with top of funnel not more than 48 inches (1200 mm) above the floor. Install feeder in minimum NPS 3/4 (DN 20) bypass line, from main with full-size, full-port, ball valve in the main between bypass connections. Install NPS 3/4 (DN 20) pipe from chemical feeder drain, to nearest equipment drain and include a full-size, full-port, ball valve.

E. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure tank is properly charged with air to suit system Project requirements.

3.7 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Division 23 Section "Meters and Gages for HVAC Piping."

3.8 CHEMICAL TREATMENT

A. Perform an analysis of makeup water to determine type and quantities of chemical treatment needed to keep system free of scale, corrosion, and fouling, and to sustain the following water characteristics:

1. pH: 9.0 to 10.5.

2. "P" Alkalinity: 100 to 500 ppm.
3. Boron: 100 to 200 ppm.
4. Chemical Oxygen Demand: Maximum 100 ppm. Modify this value if closed system contains glycol.
5. Corrosion Inhibitor:
   a. Sodium Nitrate: 1000 to 1500 ppm.
   b. Molybdate: 200 to 300 ppm.
   c. Chromate: 200 to 300 ppm.
   d. Sodium Nitrate Plus Molybdate: 100 to 200 ppm each.
   e. Chromate Plus Molybdate: 50 to 100 ppm each.
6. Soluble Copper: Maximum 0.20 ppm.
7. Tolyiriazole Copper and Yellow Metal Corrosion Inhibitor: Minimum 10 ppm.
8. Total Suspended Solids: Maximum 10 ppm.
9. Ammonia: Maximum 20 ppm.
10. Free Caustic Alkalinity: Maximum 20 ppm.
11. Microbiological Limits:
    a. Total Aerobic Plate Count: Maximum 1000 organisms/ml.
    b. Total Anaerobic Plate Count: Maximum[100 organisms/ml.
    c. Nitrate Reducers: 100 organisms/ml.
    d. Sulfate Reducers: Maximum 0 organisms/ml.
    e. Iron Bacteria: Maximum 0 organisms/ml.

B. Fill system with fresh water and add liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products from piping. Circulate solution for a minimum of 24 hours, drain, clean strainer screens, and refill with fresh water.

C. Add initial chemical treatment and maintain water quality in ranges noted above for the first year of operation.

D. Fill systems indicated to have antifreeze or glycol solutions with the following concentrations:

1. Hot-Water Heating Piping for AHU & MAU Coils only: Minimum 30 percent propylene glycol.
2. Glycol Ground Source-Water Piping: Minimum 15 percent propylene glycol.

3.9 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION 23 21 13

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SECTION 23 21 23 - HYDRONIC PUMPS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Close-coupled, in-line centrifugal pumps.
2. Close-coupled, end-suction centrifugal pumps.

1.3 DEFINITIONS

A. Buna-N: Nitrile rubber.

B. EPT: Ethylene propylene terpolymer.

1.4 SUBMITTALS

A. Product Data: Include certified performance curves and rated capacities, operating characteristics, furnished specialties, final impeller dimensions, and accessories for each type of product indicated. Indicate pump's operating point on curves.

B. Shop Drawings: Show pump layout and connections. Include setting drawings with templates for installing foundation and anchor bolts and other anchorages.

1. Wiring Diagrams: Power, signal, and control wiring.

C. Operation and Maintenance Data: For pumps to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hydronic pumps through one source from a single manufacturer.

B. Product Options: Drawings indicate size, profiles, and dimensional requirements of hydronic pumps and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

D. UL Compliance: Comply with UL 778 for motor-operated water pumps.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Manufacturer's Preparation for Shipping: Clean flanges and exposed machined metal surfaces and treat with anticorrosion compound after assembly and testing. Protect flanges, pipe openings, and nozzles with wooden flange covers or with screwed-in plugs.

B. Store pumps in dry location.

C. Retain protective covers for flanges and protective coatings during storage.

D. Protect bearings and couplings against damage from sand, grit, and other foreign matter.

E. Comply with pump manufacturer's written rigging instructions.

1.7 COORDINATION

A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.

1.8 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Mechanical Seals: One mechanical seal(s) for each pump.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 CLOSE-COUPLED, IN-LINE CENTRIFUGAL PUMPS

A. Manufacturers:

1. Bell & Gossett; Div. of ITT Industries.
2. Peerless Pump; a Member of the Sterling Fluid Systems Group.
3. Taco, Inc.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, in-line pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally or vertically. Rate pump for 125-psig (860-kPa) minimum working pressure and a continuous water temperature of 225 deg F (107 deg C).

C. Pump Construction:

1. Casing: Radially split, cast iron, with replaceable bronze wear rings, threaded gage tappings at inlet and outlet, and threaded companion-flange connections.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. Trim impeller to match specified performance.
3. Pump Shaft: Steel, with copper-alloy shaft sleeve.
4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and Buna-N bellows and gasket. Include water slinger on shaft between motor and seal.
5. Packing Seal: Stuffing box, with a minimum of four rings of graphite-impregnated braided yarn with bronze lantern ring between center two graphite rings, and bronze packing gland.
6. Pump Bearings: Permanently lubricated ball bearings.

D. Motor: Single speed, with permanently lubricated ball bearings, unless otherwise indicated; and rigidly mounted to pump casing. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

2.3 CLOSE-COUPLED, END-SUCTION CENTRIFUGAL PUMPS

A. Manufacturers:

1. Bell & Gossett; Div. of ITT Industries.
2. Peerless Pump; a Member of the Sterling Fluid Systems Group.
3. Taco, Inc.

B. Description: Factory-assembled and -tested, centrifugal, overhung-impeller, close-coupled, end-suction pump as defined in HI 1.1-1.2 and HI 1.3; designed for installation with pump and motor shafts mounted horizontally. Rate pump for 125-psig (860-kPa) minimum working pressure and a continuous water temperature of 225 deg F (107 deg C).

C. Pump Construction:

1. Casing: Radially split, cast iron, with replaceable bronze wear rings, drain plug at bottom and air vent at top of volute, threaded gage tappings at inlet and outlet, and threaded companion-flange connections.
2. Impeller: ASTM B 584, cast bronze; statically and dynamically balanced, keyed to shaft, and secured with a locking cap screw. Trim impeller to match specified performance.
3. Pump Shaft: Steel, with copper-alloy shaft sleeve.
4. Mechanical Seal: Carbon rotating ring against a ceramic seat held by a stainless-steel spring, and Buna-N bellows and gasket. Include water slinger on shaft between motor and seal.

5. Pump Bearings: Permanently lubricated ball bearings.
6. Motor: Single speed, with permanently lubricated ball bearings, unless otherwise indicated; rigidly mounted to pump casing with integral pump support. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

2.4 PUMP SPECIALTY FITTINGS

A. Suction Diffuser: Angle pattern, 175-psig (1204-kPa) pressure rating, cast-iron body and end cap, pump-inlet fitting; with bronze startup and bronze or stainless-steel permanent strainers; bronze or stainless-steel straightening vanes; drain plug; and factory-fabricated support.

B. Triple-Duty Valve: Angle or straight pattern, 175-psig (1204-kPa) pressure rating, cast-iron body, pump-discharge fitting; with drain plug and bronze-fitted shutoff, balancing, and check valve features. Brass gage ports with integral check valve, and orifice for flow measurement.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine equipment foundations and anchor-bolt locations for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine roughing-in for piping systems to verify actual locations of piping connections before pump installation.

C. Examine foundations and inertia bases for suitable conditions where pumps are to be installed.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 CONCRETE BASES

A. Install concrete bases of dimensions indicated for pumps and controllers. Refer to Division 23 Section "Common Work Results for HVAC."

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.

B. Cast-in-place concrete materials and placement requirements are specified in Division 03.

3.3 PUMP INSTALLATION

A. Comply with HI 1.4.

B. Install pumps with access for periodic maintenance including removal of motors, impellers, couplings, and accessories.

C. Independently support pumps and piping so weight of piping is not supported by pumps and weight of pumps is not supported by piping.

D. Install continuous-thread hanger rods and spring hangers with vertical-limit stop of sufficient size to support pump weight. Vibration isolation devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment." Fabricate brackets or supports as required. Hanger and support materials are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

E. Suspend vertically mounted, in-line centrifugal pumps independent of piping. Install pumps with motor and pump shafts vertical. Use continuous-thread hanger rods and spring hangers with vertical-limit stop of sufficient size to support pump weight. Vibration isolation devices are specified in Division 21 Section "Vibration and Seismic Controls for Fire-Suppression Piping and Equipment." Hanger and support materials are specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment/Hangers and Supports for HVAC Piping and Equipment."

F. Set base-mounted pumps on concrete foundation. Disconnect coupling before setting. Do not reconnect couplings until alignment procedure is complete.

1. Support pump baseplate on rectangular metal blocks and shims, or on metal wedges with small taper, at points near foundation bolts to provide a gap of 3/4 to 1-1/2 inches (19 to 38 mm) between pump base and foundation for grouting.
2. Adjust metal supports or wedges until pump and driver shafts are level. Check coupling faces and suction and discharge flanges of pump to verify that they are level and plumb.

G. Automatic Condensate Pump Units: Install units for collecting condensate and extend to open drain.

3.4 ALIGNMENT

A. Align pump and motor shafts and piping connections after setting on foundation, grout has been set and foundation bolts have been tightened, and piping connections have been made.

B. Comply with pump and coupling manufacturers' written instructions.

C. Adjust pump and motor shafts for angular and offset alignment by methods specified in HI 1.1-1.5, "Centrifugal Pumps for Nomenclature, Definitions, Application and Operation."

D. After alignment is correct, tighten foundation bolts evenly but not too firmly. Completely fill baseplate with nonshrink, nonmetallic grout while metal blocks and shims or wedges are in place. After grout has cured, fully tighten foundation bolts.

3.5 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect piping to pumps. Install valves that are same size as piping connected to pumps.

D. Install suction and discharge pipe sizes equal to or greater than diameter of pump nozzles.

E. Install triple-duty valve on discharge side of pumps.

F. Install suction diffuser and shutoff valve on suction side of pumps.

G. Install flexible connectors on suction and discharge sides of base-mounted pumps between pump casing and valves.

H. Install pressure gages on pump suction and discharge, at integral pressure-gage tapping, or install single gage with multiple input selector valve.

I. Install check valve and gate or ball valve on each condensate pump unit discharge.

J. Install electrical connections for power, controls, and devices.

K. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

L. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.6 STARTUP SERVICE

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping.
4. Perform the following startup checks for each pump before starting:
   a. Verify bearing lubrication.
   b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
   c. Verify that pump is rotating in the correct direction.
5. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
6. Start motor.
7. Open discharge valve slowly.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain hydronic pumps. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 23 21 23

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SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes refrigerant piping used for air-conditioning applications.

1.3 PERFORMANCE REQUIREMENTS

A. Line Test Pressure for Refrigerant R-32:

1. Suction Lines for Air-Conditioning Applications: 300 psig (2068 kPa).
2. Suction Lines for Heat-Pump Applications: 535 psig (3689 kPa).
3. Hot-Gas and Liquid Lines: 535 psig (3689 kPa).

1.4 SUBMITTALS

A. Product Data: For each type of valve and refrigerant piping specialty indicated. Include pressure drop, based on manufacturer's test data, for the following:

1. Thermostatic expansion valves.
2. Solenoid valves.
3. Filter dryers.
4. Strainers.
5. Pressure-regulating valves.

B. Shop Drawings: Show layout of refrigerant piping and specialties, including pipe, tube, and fitting sizes, flow capacities, valve arrangements and locations, slopes of horizontal runs, oil traps, double risers, wall and floor penetrations, and equipment connection details. Show interface and spatial relationships between piping and equipment.

1. Shop Drawing Scale: **1/4 inch equals 1 foot (1:50)**.
2. Refrigerant piping indicated on Drawings is schematic only. Size piping and design actual piping layout, including oil traps, double risers, specialties, and pipe and tube sizes to accommodate, as a minimum, equipment provided, elevation difference between compressor and evaporator, and length of piping to ensure proper operation and compliance with warranties of connected equipment.

C. Welding certificates.

D. Field quality-control test reports.

E. Operation and Maintenance Data: For refrigerant valves and piping specialties to include in maintenance manuals.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. Comply with ASHRAE 15, "Safety Code for Refrigeration Systems."

C. Comply with ASME B31.5, "Refrigeration Piping and Heat Transfer Components."

1.6 PRODUCT STORAGE AND HANDLING

A. Store piping in a clean and protected area with end caps in place to ensure that piping interior and exterior are clean when installed.

1.7 COORDINATION

A. Coordinate size and location of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Copper Tube: ASTM B 88, Type K or L

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Brazing Filler Metals: AWS A5.8.

E. Flexible Connectors:

1. Body: Tin-bronze bellows with woven, flexible, tinned-bronze-wire-reinforced protective jacket.
2. End Connections: Socket ends.
3. Offset Performance: Capable of minimum 3/4-inch (20-mm) misalignment in minimum 7-inch- (180-mm-) long assembly.
4. Pressure Rating: Factory test at minimum 500 psig (3450 kPa).
5. Maximum Operating Temperature: 250 deg F (121 deg C).

2.2 VALVES AND SPECIALTIES

A. Diaphragm Packless Valves:

1. Body and Bonnet: Forged brass or cast bronze; globe design with straight-through or angle pattern.
2. Diaphragm: Phosphor bronze and stainless steel with stainless-steel spring.
3. Operator: Rising stem and hand wheel.
4. Seat: Nylon.
5. End Connections: Socket, union, or flanged.
6. Working Pressure Rating: 500 psig (3450 kPa).
7. Maximum Operating Temperature: 275 deg F (135 deg C).

B. Packed-Angle Valves:

1. Body and Bonnet: Forged brass or cast bronze.
2. Packing: Molded stem, back seating, and replaceable under pressure.
3. Operator: Rising stem.
4. Seat: Nonrotating, self-aligning polytetrafluoroethylene.
5. Seal Cap: Forged-brass or valox hex cap.
6. End Connections: Socket, union, threaded, or flanged.
7. Working Pressure Rating: 500 psig (3450 kPa).
8. Maximum Operating Temperature: 275 deg F (135 deg C).

C. Check Valves:

1. Body: Ductile iron, forged brass, or cast bronze; globe pattern.
2. Bonnet: Bolted ductile iron, forged brass, or cast bronze; or brass hex plug.
3. Piston: Removable polytetrafluoroethylene seat.
4. Closing Spring: Stainless steel.
5. Manual Opening Stem: Seal cap, plated-steel stem, and graphite seal.
6. End Connections: Socket, union, threaded, or flanged.
7. Maximum Opening Pressure: 0.50 psig (3.4 kPa).
8. Working Pressure Rating: 500 psig (3450 kPa).
9. Maximum Operating Temperature: 275 deg F (135 deg C).

D. Service Valves:

1. Body: Forged brass with brass cap including key end to remove core.
2. Core: Removable ball-type check valve with stainless-steel spring.
3. Seat: Polytetrafluoroethylene.
4. End Connections: Copper spring.
5. Working Pressure Rating: 500 psig (3450 kPa).

E. Safety Relief Valves: Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.

1. Body and Bonnet: Ductile iron and steel, with neoprene O-ring seal.
2. Piston, Closing Spring, and Seat Insert: Stainless steel.
3. Seat Disc: Polytetrafluoroethylene.
4. End Connections: Threaded.
5. Working Pressure Rating: 400 psig (2760 kPa).
6. Maximum Operating Temperature: 240 deg F (116 deg C).

F. Angle-Type Strainers:

1. Body: Forged brass or cast bronze.
2. Drain Plug: Brass hex plug.
3. Screen: 100-mesh monel.
4. End Connections: Socket or flare.
5. Working Pressure Rating: 500 psig (3450 kPa).
6. Maximum Operating Temperature: 275 deg F (135 deg C).

G. Moisture/Liquid Indicators:

1. Body: Forged brass.
2. Window: Replaceable, clear, fused glass window with indicating element protected by filter screen.
3. Indicator: Color coded to show moisture content in ppm.
4. Minimum Moisture Indicator Sensitivity: Indicate moisture above 60 ppm.
5. End Connections: Socket or flare.
6. Working Pressure Rating: 500 psig (3450 kPa).
7. Maximum Operating Temperature: 240 deg F (116 deg C).

H. Replaceable-Core Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell with ductile-iron cover, stainless-steel screws, and neoprene gaskets.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated [**alumina**] [**charcoal**].
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: [**2 psig (14 kPa)**] <**Insert value**>.
8. Rated Flow: <**Insert tons (kW).**>
9. Working Pressure Rating: 500 psig (3450 kPa).
10. Maximum Operating Temperature: 240 deg F (116 deg C).

I. Permanent Filter Dryers: Comply with ARI 730.

1. Body and Cover: Painted-steel shell.
2. Filter Media: 10 micron, pleated with integral end rings; stainless-steel support.
3. Desiccant Media: Activated [**alumina**] [**charcoal**].
4. Designed for reverse flow (for heat-pump applications).
5. End Connections: Socket.
6. Access Ports: NPS 1/4 (DN 8) connections at entering and leaving sides for pressure differential measurement.
7. Maximum Pressure Loss: [**2 psig (14 kPa)**] <**Insert value**>.
8. Rated Flow: <**Insert tons (kW).**>
9. Working Pressure Rating: 500 psig (3450 kPa).
10. Maximum Operating Temperature: 240 deg F (116 deg C).

J. Mufflers:

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or flare.

3. Working Pressure Rating: 500 psig (3450 kPa).
4. Maximum Operating Temperature: 275 deg F (135 deg C).

K. Receivers: Comply with ARI 495.

1. Comply with ASME Boiler and Pressure Vessel Code; listed and labeled by an NRTL.
2. Comply with UL 207; listed and labeled by an NRTL.
3. Body: Welded steel with corrosion-resistant coating.
4. Tappings: Inlet, outlet, liquid level indicator, and safety relief valve.
5. End Connections: Socket or threaded.
6. Working Pressure Rating: 500 psig (3450 kPa).
7. Maximum Operating Temperature: 275 deg F (135 deg C).

L. Liquid Accumulators: Comply with ARI 495.

1. Body: Welded steel with corrosion-resistant coating.
2. End Connections: Socket or threaded.
3. Working Pressure Rating: 500 psig (3450 kPa).
4. Maximum Operating Temperature: 275 deg F (135 deg C).

2.3 REFRIGERANTS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Atofina Chemicals, Inc.
2. DuPont Company; Fluorochemicals Div.
3. Honeywell, Inc.; Genetron Refrigerants.
4. INEOS Fluor Americas LLC.

C. ASHRAE 34, R-32: difluoromethane.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS FOR REFRIGERANT R-410A

A. Suction Lines **NPS 1-1/2 (DN 40) and Smaller** for Conventional Air-Conditioning Applications: Copper, Type ACR, annealed-temper tubing and wrought-copper fittings with **brazed** joints.

B. Safety-Relief-Valve Discharge Piping: Copper, Type **L (B)**, annealed- or drawn-temper tubing and wrought-copper fittings with **brazed** joints.

C. Safety-Relief-Valve Discharge Piping: Copper, Type K (A), annealed- or drawn-temper tubing and wrought-copper fittings with **brazed** joints.

D. Safety-Relief-Valve Discharge Piping:

1. **NPS 3/4 to NPS 1 (DN 20 to DN 25) and Smaller** : Copper, Type K (A), annealed- or drawn-temper tubing and wrought-copper fittings with **brazed** joints.

3.2 VALVE AND SPECIALTY APPLICATIONS

A. Install **diaphragm packless** valves in suction and discharge lines of compressor.

B. Install service valves for gage taps at inlet and outlet of hot-gas bypass valves and strainers if they are not an integral part of valves and strainers.

C. Install a check valve at the compressor discharge and a liquid accumulator at the compressor suction connection.

D. Except as otherwise indicated, install **diaphragm packless** valves on inlet and outlet side of filter dryers.

E. Install a full-sized, three-valve bypass around filter dryers.

F. Install solenoid valves upstream from each expansion valve and hot-gas bypass valve. Install solenoid valves in horizontal lines with coil at top.

G. Install thermostatic expansion valves as close as possible to distributors on evaporators.

1. Install valve so diaphragm case is warmer than bulb.
2. Secure bulb to clean, straight, horizontal section of suction line using two bulb straps. Do not mount bulb in a trap or at bottom of the line.
3. If external equalizer lines are required, make connection where it will reflect suction-line pressure at bulb location.

H. Install safety relief valves where required by ASME Boiler and Pressure Vessel Code. Pipe safety-relief-valve discharge line to outside according to ASHRAE 15.

I. Install moisture/liquid indicators in liquid line at the inlet of the thermostatic expansion valve or at the inlet of the evaporator coil capillary tube.

J. Install strainers upstream from and adjacent to the following unless they are furnished as an integral assembly for device being protected:

1. Solenoid valves.
2. Thermostatic expansion valves.
3. Hot-gas bypass valves.
4. Compressor.

K. Install filter dryers in liquid line between compressor and thermostatic expansion valve.

L. Install receivers sized to accommodate pump-down charge.

M. Install flexible connectors at compressors.

3.3 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems; indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Shop Drawings.

B. Install refrigerant piping according to ASHRAE 15.

C. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping adjacent to machines to allow service and maintenance.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Select system components with pressure rating equal to or greater than system operating pressure.

J. Refer to Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls" for solenoid valve controllers, control wiring, and sequence of operation.

K. Install piping as short and direct as possible, with a minimum number of joints, elbows, and fittings.

L. Arrange piping to allow inspection and service of refrigeration equipment. Install valves and specialties in accessible locations to allow for service and inspection. Install access doors or panels as specified in Division 08 Section "Access Doors and Frames" if valves or equipment requiring maintenance is concealed behind finished surfaces.

M. Install refrigerant piping in protective conduit where installed belowground.

N. Install refrigerant piping in rigid or flexible conduit in locations where exposed to mechanical injury.

O. Slope refrigerant piping as follows:

1. Install horizontal hot-gas discharge piping with a uniform slope downward away from compressor.
2. Install horizontal suction lines with a uniform slope downward to compressor.
3. Install traps and double risers to entrain oil in vertical runs.
4. Liquid lines may be installed level.

P. When brazing, remove solenoid-valve coils and sight glasses; also remove valve stems, seats, and packing, and accessible internal parts of refrigerant specialties. Do not apply heat near expansion-valve bulb.

Q. Install piping with adequate clearance between pipe and adjacent walls and hangers or between pipes for insulation installation.

R. Identify refrigerant piping and valves according to Division 23 Section "Identification for HVAC Piping and Equipment."

S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 23 Section "Sleeves and Sleeve Seals for HVAC Piping."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 23 Section "Escutcheons for HVAC Piping."

V. Install 16 GA. steel shield plates to protect any refrigerant piping installed within walls.

3.4 PIPE JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

C. Fill pipe and fittings with an inert gas (nitrogen or carbon dioxide), during brazing or welding, to prevent scale formation.

D. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."

1. Use Type BcuP, copper-phosphorus alloy for joining copper socket fittings with copper pipe.
2. Use Type BAg, cadmium-free silver alloy for joining copper with bronze or steel.

E. Threaded Joints: Thread steel pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry-seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

F. Steel pipe can be threaded, but threaded joints must be seal brazed or seal welded.

G. Welded Joints: Construct joints according to AWS D10.12/D10.12M.

H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

3.5 HANGERS AND SUPPORTS

A. Hanger, support, and anchor products are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

B. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal runs less than 20 feet (6 m) long.
2. Roller hangers and spring hangers for individual horizontal runs 20 feet (6 m) or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.

C. Install hangers for copper tubing with the following maximum spacing and minimum rod sizes:

1. NPS 1/2 (DN 15): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
2. NPS 5/8 (DN 18): Maximum span, 60 inches (1500 mm); minimum rod size, 1/4 inch (6.4 mm).
3. NPS 1 (DN 25): Maximum span, 72 inches (1800 mm); minimum rod size, 1/4 inch (6.4 mm).
4. NPS 1-1/4 (DN 32): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).
5. NPS 1-1/2 (DN 40): Maximum span, 96 inches (2400 mm); minimum rod size, 3/8 inch (9.5 mm).

D. Support multifloor vertical runs at least at each floor.

3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. Comply with ASME B31.5, Chapter VI.
2. Test refrigerant piping, specialties, and receivers. Isolate compressor, condenser, evaporator, and safety devices from test pressure if they are not rated above the test pressure.
3. Test high- and low-pressure side piping of each system separately at not less than the pressures indicated in Part 1 "Performance Requirements" Article.

   a. Fill system with nitrogen to the required test pressure.
   b. System shall maintain test pressure at the manifold gage throughout duration of test.
   c. Test joints and fittings with electronic leak detector or by brushing a small amount of soap and glycerin solution over joints.

d. Remake leaking joints using new materials, and retest until satisfactory results are achieved.

3.7 SYSTEM CHARGING

A. Charge system using the following procedures:

1. Install core in filter dryers after leak test but before evacuation.
2. Evacuate entire refrigerant system with a vacuum pump to 500 micrometers (67 Pa). If vacuum holds for 12 hours, system is ready for charging.
3. Break vacuum with refrigerant gas, allowing pressure to build up to 2 psig (14 kPa).
4. Charge system with a new filter-dryer core in charging line.

3.8 ADJUSTING

A. Adjust thermostatic expansion valve to obtain proper evaporator superheat.

B. Adjust high- and low-pressure switch settings to avoid short cycling in response to fluctuating suction pressure.

C. Adjust set-point temperature of air-conditioning or chilled-water controllers to the system design temperature.

D. Perform the following adjustments before operating the refrigeration system, according to manufacturer's written instructions:

1. Open shutoff valves in condenser water circuit.
2. Verify that compressor oil level is correct.
3. Open compressor suction and discharge valves.
4. Open refrigerant valves except bypass valves that are used for other purposes.
5. Check open compressor-motor alignment and verify lubrication for motors and bearings.

E. Replace core of replaceable filter dryer after system has been adjusted and after design flow rates and pressures are established.

END OF SECTION 232300

SECTION 23 25 00 - HVAC WATER TREATMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following HVAC water-treatment systems:

1. Bypass chemical-feed equipment and controls.
2. Chemical treatment test equipment.
3. HVAC water-treatment chemicals.

1.3 DEFINITIONS

A. EEPROM: Electrically erasable, programmable read-only memory.

B. Low Voltage: As defined in NFPA 70 for circuits and equipment operating at less than 50 V or for remote-control, signaling power-limited circuits.

C. RO: Reverse osmosis.

D. TDS: Total dissolved solids.

E. UV: Ultraviolet.

1.4 PERFORMANCE REQUIREMENTS

A. Water quality for HVAC systems shall minimize corrosion, scale buildup, and biological growth for optimum efficiency of HVAC equipment without creating a hazard to operating personnel or the environment.

B. Base HVAC water treatment on quality of water available at Project site, HVAC system equipment material characteristics and functional performance characteristics, operating personnel capabilities, and requirements and guidelines of authorities having jurisdiction.

C. Closed hydronic systems, including hot-water heating and chilled water, shall have the following water qualities:

1. pH: Maintain a value within 9.0 to 10.5.
2. "P" Alkalinity: Maintain a value within 100 to 500 ppm.
3. Boron: Maintain a value within 100 to 200 ppm.

4. Chemical Oxygen Demand: Maintain a maximum value of 100 ppm.
5. Soluble Copper: Maintain a maximum value of 0.20 ppm.
6. TDS: Maintain a maximum value of 10 ppm.
7. Ammonia: Maintain a maximum value of 20 ppm.
8. Free Caustic Alkalinity: Maintain a maximum value of 20 ppm.
9. Microbiological Limits:
   a. Total Aerobic Plate Count: Maintain a maximum value of 1000 organisms/ml.
   b. Total Anaerobic Plate Count: Maintain a maximum value of 100 organisms/ml.
   c. Nitrate Reducers: Maintain a maximum value of 100 organisms/ml.
   d. Sulfate Reducers: Maintain a maximum value of 0 organisms/ml.
   e. Iron Bacteria: Maintain a maximum value of 0 organisms/ml.

D. Passivation for Galvanized Steel: For the first 60 days of operation.

1. pH: Maintain a value within 7 to 8.
2. Calcium Carbonate Hardness: Maintain a value within 100 to 300 ppm.
3. Calcium Carbonate Alkalinity: Maintain a value within 100 to 300 ppm.

1.5 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for the following products:

1. Bypass feeders.
2. Water meters.
3. Inhibitor injection timers.
4. pH controllers.
5. TDS controllers.
6. Biocide feeder timers.
7. Chemical solution tanks.
8. Injection pumps.
9. Ozone generators.
10. UV-irradiation units.
11. Chemical test equipment.
12. Chemical material safety data sheets.
13. Water softeners.
14. RO units.
15. Multimedia filters.
16. Self-cleaning strainers.
17. Bag- or cartridge-type filters.
18. Centrifugal separators.

B. Shop Drawings: Pretreatment and chemical treatment equipment showing tanks, maintenance space required, and piping connections to HVAC systems. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: Power and control wiring.

C. Field quality-control test reports.

D. Operation and Maintenance Data: For sensors, injection pumps, and controllers to include in emergency, operation, and maintenance manuals.

E. Other Informational Submittals:

1. Water-Treatment Program: Written sequence of operation on an annual basis for the application equipment required to achieve water quality defined in the "Performance Requirements" Article above.
2. Water Analysis: Illustrate water quality available at Project site.
3. Passivation Confirmation Report: Verify passivation of galvanized-steel surfaces, and confirm this observation in a letter to Architect.

1.6 QUALITY ASSURANCE

A. HVAC Water-Treatment Service Provider Qualifications: An experienced HVAC water-treatment service provider capable of analyzing water qualities, installing water-treatment equipment, and applying water treatment as specified in this Section.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.7 MAINTENANCE SERVICE

A. Scope of Maintenance Service: Provide chemicals and service program to maintain water conditions required above to inhibit corrosion, scale formation, and biological growth for cooling, chilled-water piping, heating, hot-water piping and equipment. Services and chemicals shall be provided for a period of one year from date of Substantial Completion, and shall include the following:

1. Initial water analysis and HVAC water-treatment recommendations.
2. Startup assistance for Contractor to flush the systems, clean with detergents, and initially fill systems with required chemical treatment prior to operation.
3. Periodic field service and consultation.
4. Customer report charts and log sheets.
5. Laboratory technical analysis.
6. Analyses and reports of all chemical items concerning safety and compliance with government regulations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, the following:

1. Aqua-Chem, Inc.; Cleaver-Brooks Div.
2. Barclay Chemical Co.; Water Management, Inc.
3. H-O-H Chemicals, Inc.

2.2 MANUAL CHEMICAL-FEED EQUIPMENT

A. Bypass Feeders: Steel, with corrosion-resistant exterior coating, minimum 3-1/2-inch (89-mm) fill opening in the top, and NPS 3/4 (DN 20) bottom inlet and top side outlet. Quarter turn or threaded fill cap with gasket seal and diaphragm to lock the top on the feeder when exposed to system pressure in the vessel.

1. Capacity: 5 gal. (19 L).
2. Minimum Working Pressure: 125 psig (860 kPa).

2.3 STAINLESS-STEEL PIPES AND FITTINGS

A. Stainless-Steel Tubing: Comply with ASTM A 269, Type 316.

B. Stainless-Steel Fittings: Complying with ASTM A 815/A 815M, Type 316, Grade WP-S.

C. Two-Piece, Full-Port, Stainless-Steel Ball Valves: ASTM A 351, Type 316 stainless-steel body; ASTM A 276, Type 316 stainless-steel stem and vented ball, carbon-filled TFE seats, threaded body design with adjustable stem packing, threaded ends, and 250-psig (1725-kPa) SWP and 600-psig (4140-kPa) CWP ratings.

D. Three-Piece, Full-Port, Stainless-Steel Ball Valves: ASTM A 351, Type 316 stainless-steel body; ASTM A 276, Type 316 stainless-steel stem and vented ball, threaded body design with adjustable stem packing, threaded ends, and 150-psig (1035-kPa) SWP and 600-psig (4140-kPa) CWP rating.

2.4 CHEMICAL TREATMENT TEST EQUIPMENT

A. Test Kit: Manufacturer-recommended equipment and chemicals in a wall-mounting cabinet for testing pH, TDS, inhibitor, chloride, alkalinity, and hardness; sulfite and testable polymer tests for high-pressure boilers, and oxidizing biocide test for open cooling systems.

B. Sample Cooler:

1. Tube: Sample.
   a. Size: NPS 1/4 (DN 8) tubing.
   b. Material: ASTM A 666, Type 316 stainless steel.
   c. Pressure Rating: Minimum 2000 psig (13 790 kPa).
   d. Temperature Rating: Minimum 850 deg F (454 deg C).
2. Shell: Cooling water.
   a. Material: ASTM A 666, Type 304 stainless steel.
   b. Pressure Rating: Minimum 250 psig (1725 kPa).
   c. Temperature Rating: Minimum 450 deg F (232 deg C).
3. Capacities and Characteristics:
   a. Tube: Sample.
      1) Flow Rate: 0.25 gpm (0.016 L/s).
      2) Entering Temperature: 400 deg F (204 deg C).
      3) Leaving Temperature: 88 deg F (31 deg C).
      4) Pressure Loss: 6.5 psig (44.8 kPa).
   b. Shell: Cooling water.
      1) Flow Rate: 3 gpm (0.19 L/s).

2) Entering Temperature: 70 deg F (21 deg C).
3) Pressure Loss: 1.0 psig (6.89 kPa).

C. Corrosion Test-Coupon Assembly: Constructed of corrosive-resistant material, complete with piping, valves, and mild steel and copper coupons. Locate copper coupon downstream from mild steel coupon in the test-coupon assembly.

1. Two-station rack for closed-loop systems.

2.5 CHEMICALS

A. Chemicals shall be as recommended by water-treatment system manufacturer that are compatible with piping system components and connected equipment, and that can attain water quality specified in Part 1 "Performance Requirements" Article.

B. Water Softener Chemicals:

1. Mineral: High-capacity, sulfonated-polystyrene ion-exchange resin that is stable over entire pH range with good resistance to bead fracture from attrition or shock. Resin exchange capacity minimum 30,000 grains/cu. ft. (69 kg/cu. m) of calcium carbonate of resin when regenerated with 15 lb (6.8 kg) of salt.
2. Salt for Brine Tanks: High-purity sodium chloride, free of dirt and foreign material. Rock and granulated forms are not acceptable.

2.6 Glycol-Water Make-up System:

A. Glycol Water Storage Tank: Self-supporting polyethylene, minimum 90 mil thickness, with removable. Capacity shall be 55 gallons, with approximate diameter of 23 inches and height of 48 inches. Reinforced threaded pipe connections shall be provided for all connections. Provide identification for tank showing name of the contents.

B. Glycol Water Make up Pump: Bronze fitted, self-priming, high head type suitable for pumping a 15 percent to 30 percent glycol water solution in intermittent service. The pump shall be provided with a mechanical shaft seal and be flange connected to a 1750 rpm NEMA Type C motor. The pump capacity shall be 2 gpm, 100 psig discharge pressure, with a 1/3 horsepower drip proof motor. The pump shall be a regenerative turbine type providing self-priming with built in or external relief valve set for design head of the pump.

C. Back Pressure Regulating Valve: Spring loaded, diaphragm actuated type with bronze or steel body, stainless-steel trim with capacity to relieve 100 percent of pump flow with an allowable rise in the regulated pressure of 69 kPa (10 psig) above the set point. Set point shall be 103 kPa (15 psig) above system PRV setting.

D. Low Water Level Control: Steel or plastic float housing, stainless steel or plastic float, positive snap acting SPST switch mechanism, rated 10 amps 120-volt AC, in General Purpose (NEMA 1) enclosure. The control shall be rated for pressures to 1034 kPa (150 psig) and make alarm circuit on low water level. The alarm circuit shall be wired to an alarm light on the nearest local Temperature Control panel (LTCP). Provide remote output relay to indicate alarm condition at the Building Control System specified under Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 3 - EXECUTION

3.1 WATER ANALYSIS

A. Perform an analysis of supply water to determine quality of water available at Project site.

3.2 INSTALLATION

A. Install chemical application equipment on concrete bases, level and plumb. Maintain manufacturer's recommended clearances. Arrange units so controls and devices that require servicing are accessible. Anchor chemical tanks and floor-mounting accessories to substrate.

B. Install seismic restraints for equipment and floor-mounting accessories and anchor to building structure. Refer to Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment" for seismic restraints.

C. Install water testing equipment on wall near water chemical application equipment.

D. Install interconnecting control wiring for chemical treatment controls and sensors.

E. Mount sensors and injectors in piping circuits.

F. Bypass Feeders: Install in closed hydronic systems, including hot-water heating and chilled water equipped with the following:

1. Install bypass feeder in a bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
2. Install water meter in makeup water supply.
3. Install test-coupon assembly in bypass circuit around circulating pumps, unless otherwise indicated on Drawings.
4. Install a gate or full-port ball isolation valves on inlet, outlet, and drain below feeder inlet.
5. Install a swing check on inlet after the isolation valve.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Make piping connections between HVAC water-treatment equipment and dissimilar-metal piping with dielectric fittings. Dielectric fittings are specified in Division 23 Section "Common Work Results for HVAC."

D. Install shutoff valves on HVAC water-treatment equipment inlet and outlet. Metal general-duty valves are specified in Division 23 Section "General-Duty Valves for HVAC Piping."

E. Refer to Division 22 Section "Domestic Water Piping Specialties" for backflow preventers required in makeup water connections to potable-water systems.

F. Confirm applicable electrical requirements in Division 26 Sections for connecting electrical equipment.

G. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

H. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Inspect field-assembled components and equipment installation, including piping and electrical connections.
2. Inspect piping and equipment to determine that systems and equipment have been cleaned, flushed, and filled with water, and are fully operational before introducing chemicals for water-treatment system.
3. Place HVAC water-treatment system into operation and calibrate controls during the preliminary phase of HVAC systems' startup procedures.
4. Do not enclose, cover, or put piping into operation until it is tested and satisfactory test results are achieved.
5. Test for leaks and defects. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
6. Leave uncovered and unconcealed new, altered, extended, and replaced water piping until it has been tested and approved. Expose work that has been covered or concealed before it has been tested and approved.
7. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow test pressure to stand for four hours. Leaks and loss in test pressure constitute defects.
8. Repair leaks and defects with new materials and retest piping until no leaks exist.

D. Remove and replace malfunctioning units and retest as specified above.

E. Sample heat pump water at one-week intervals after heat pump startup for a period of five weeks, and prepare test report advising Owner of changes necessary to adhere to Part 1 "Performance Requirements" Article for each required characteristic. Sample heat pump water at four-week intervals following the testing noted above to show that automatic chemical-feed systems are maintaining water quality within performance requirements specified in this Section.

F. At four-week intervals following Substantial Completion, perform separate water analyses on hydronic systems to show that automatic chemical-feed systems are maintaining water quality within performance requirements specified in this Section. Submit written reports of water analysis advising Owner of changes necessary to adhere to Part 1 "Performance Requirements" Article.

G. Comply with ASTM D 3370 and with the following standards:

1. Silica: ASTM D 859.
2. Steam System: ASTM D 1066.
3. Acidity and Alkalinity: ASTM D 1067.
4. Iron: ASTM D 1068.
5. Water Hardness: ASTM D 1126.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC water-treatment systems and equipment. Refer to Division 01 Section "Demonstration and Training."

B. Training: Provide a "how-to-use" self-contained breathing apparatus video that details exact operating procedures of equipment.

END OF SECTION 23 25 00

SECTION 23 31 13 – METAL DUCTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

1.4 SUBMITTALS

A. Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.

D. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, structural steel, mechanical equipment, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:
   a. Lighting fixtures.
   b. Air outlets and inlets.
   c. Speakers.
   d. Sprinklers.
   e. Access panels.

E. Field quality-control reports

1.5 QUALITY ASSURANCE

A. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

B. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
   1. Seems shall be used for ductwork rated 3” wg and greater and shall be made with Ductmate, Ward or Nexus connections.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
   1. Seems shall be made with a Pittsburgh Lock (Type L-1)

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round Spiral Seam, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. Lindab Inc.
      b. McGill AirFlow LLC.
      c. SEMCO Incorporated.

B. GENERAL

   1. All round supply, return and exhaust ductwork shall be by the manufacturer. The duct system shall consist of fittings that are factory fitted with a sealing gasket and spiral seam duct which, when installed according to the manufacturer’s instructions, will seal the duct joints without the use of duct sealer.

   2. The contractor may, with the approval of the engineer, convert select rectangular duct-work to round provided that the project space limitations are properly addressed and that the overall system design static pressure not be exceeded.

C. MATERIALS

1. Unless otherwise noted, all duct and fittings shall be G-90 galvanized steel in accordance with ASTM A-653 and A-924.

2. When specified on contract documents, stainless steel type 304 or type 316 in accordance with ASTM A-240 shall be provided.

D. CONSTRUCTION

1. Unless otherwise noted, all duct and fittings shall be constructed per SMACNA's Duct Construction Standards (+10 in W.G.) shown in the following table:

Diameter (inches)	Galvanized Fittings
3-14	24
16-26	22
28-36	20
38-50	20

2. FITTINGS:

a. Segmented elbows shall be used with a minimum of five segments. Draw band, crimp type traverse joints, pleated, adjustable and mitered elbows are not permitted.

b. All fitting ends shall come factory equipped with a double lipped, U-profile, EPDM rubber gasket. Gasket shall be manufactured to gauge and flexibility so as to insure that system will meet all of the performance criteria set forth in the manufacturer's literature. Gasket shall be classified by an internationally recognized laboratory authority to conform to ASTM E84-91a and NFPA 90A flame spread and smoke developed ratings of 25/50.

c. All fitting ends shall be calibrated to manufacturer's published dimensional tolerance standard and associated spiral duct.

d. All fitting ends from 3" to 24" Dia. shall have rolled over edges for added strength and rigidity.

e. All elbows from 3" to 12" Dia. Shall be 2 piece die stamped and continuously stitch welded. All elbows 14" Dia. And larger shall be standing seam gorelock construction and internally sealed.

f. The radius of all 90° and 45° elbows shall be 1.5 times the elbow diameter, unless otherwise noted on the contract documents to be 1.0 times the elbow diameter. The radius of all 15°, 30° and 60° elbows shall be 1.0 times the elbow diameter.

g. All volume dampers shall be by the spiral duct manufacturer. Damper shall be fitting sized to slip into spiral duct. Damper shall have the following features:

(1) Locking quadrant with blade position indicator

(2) 2” sheet metal insulation stand-off

(3) Integral shaft/blade assembly

(4) Shaft mounted, load bearing bushings

(5) Gasketed shaft penetrations to minimize leakage

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Type 304 Stainless-Steel Sheet: Comply with ASTM E2336.

1. Finished for surfaces Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
2. Finished for surfaces Concealed: Type 304, stainless-steel sheet, No. 2D finish.
3. All kitchen exhaust grease ductwork must have welded seams and joints.

C. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90 (Z275).
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

D. Factory Applied Antimicrobial Coating:

1. Apply to the surface of sheet metal that will form the interior surface of the duct. An untreated clear coating shall be applied to the exterior surface.
2. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
3. Coating containing the antimicrobial compound shall have a hardness of 2H, minimum, when tested according to ASTM D 3363.
4. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
5. Shop-Applied Coating Color: White.
6. Antimicrobial coating on sheet metal is not required for duct containing liner treated with antimicrobial coating.

E. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

F. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 3 inches (76 mm).
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.

L. For makeup air ducts connecting to or within 18 inches of a Tpye I hood shall be noncombustible or shall be listed for the application.

M. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

D. Repair or replace damaged sections and finished work that does not comply with these requirements.

3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD GREASE DUCT

A. Grease duct shall be constructed from 16 gauge black iron steel or 18 gauge stainless steel, with all welded joints and seams.

B. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.

C. Where horizontal runs exceed 75 feet in length, install grease duct reservoir (duct sump) every 75 feet of duct run.

D. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 20 feet (6 m) in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings. Locate access panel on top or sides of duct a minimum of 1-1/2 inches (38 mm) from bottom of duct.

E. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

3.4 DUCT SEALING

A. Seal ducts for duct static-pressure and seal classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A for leakage class 4
3. Outdoor, Exhaust Ducts: Seal Class A for leakage class 4.
4. Outdoor, Return-Air Ducts: Seal Class A for leakage class 4.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower:
6. Unconditioned Space, Exhaust Ducts: Seal Class A for leakage class 4.
7. Unconditioned Space, Return-Air Ducts: Seal Class A for leakage class 4.
8. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower:
   a. Exposed: Seal Class A for leakage class 4.
   b. Concealed: Seal Class A for leakage class 4.
9. Conditioned Space, Exhaust Ducts: Seal Class A for leakage class 4.
10. Conditioned Space, Return-Air Ducts:
    a. Exposed: Seal Class A for leakage class 4.
    b. Concealed: Seal Class A for leakage class 4.

3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.7 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.8 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Duct System Cleanliness Tests:

1. Visually inspect duct system to ensure that no visible contaminants are present.
2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
   a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.

C. Duct system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.9 DUCT CLEANING

A. Clean new duct systems before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).

2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Energy recovery wheels.
6. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
7. Supply-air ducts, dampers, actuators, and turning vanes.
8. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.10 START UP

A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.11 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

B. Supply Ducts:

1. All Systems:
   a. Pressure Class: Positive 4-inch wg (500 Pa).
   b. Leakage Class: 4

C. Return Ducts:

1. All Systems:
   a. Pressure Class: Positive or negative 4-inch wg (500 Pa).
   b. Leakage Class: 4

D. Exhaust Ducts:

1. General Exhaust Ductwork:
   a. Pressure Class: Negative 4-inch wg (500 Pa).
   b. Leakage Class: 4
2. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.
   a. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
   b. Concealed: Type 304, stainless-steel sheet, No. 2D finish.
   c. Welded seams and joints.
   d. Pressure Class: Positive or negative 4-inch wg (500 Pa).
   e. Minimum SMACNA Seal Class: Welded seams, joints, and penetrations.
   f. SMACNA Leakage Class: 4

E. Outdoor-Air Ducts:

1. All Systems :
   a. Pressure Class: Positive or negative 4-inch wg (500 Pa).
   b. Leakage Class: 4

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts Galvanized steel or carbon steel coated with zinc-chromate primer.

G. Liner:

1. Transfer Air Ducts: Fibrous glass, Type I, 2 inches (51 mm) thick.

H. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."
   a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
   b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
   c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."
2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible, segmented elbows with a minimum of five segments.
   a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
      1) Velocity 1000 fpm (5 m/s) or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
      2) Velocity 1000 to 1500 fpm (5 to 7.6 m/s): 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.

3) Velocity 1500 fpm (7.6 m/s) or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
4) Radius-to Diameter Ratio: 1.5.

I. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."
   a. Rectangular Main to Rectangular Branch: 45-degree entry.
2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "45 Degree lateral," taps are permitted in existing duct.
   a. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree entry.

END OF SECTION 23 31 13

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SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

1.3 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Flange connectors.
4. Turning vanes.
5. Remote damper operators.
6. Duct-mounted access doors.
7. Flexible connectors.
8. Flexible ducts.
9. Duct accessory hardware.

B. Related Sections:

1. Division 23 Section "HVAC Gravity Ventilators" for roof-mounted ventilator caps.
2. Division 28 Section "Fire Detection and Alarm" for duct-mounted fire and smoke detectors.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.

B. LEED Submittal:

1. Product Data for Prerequisite EQ 1: Documentation indicating that units comply with ASHRAE 62.1-2004, Section 5 - "Systems and Equipment."

C. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
   a. Special fittings.
   b. Manual volume damper installations.
   c. Control damper installations.
   d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
   e. Duct security bars.
   f. Wiring Diagrams: For power, signal, and control wiring.

D. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.

E. Source quality-control reports.

F. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

1.6 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

   1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

   1. Galvanized Coating Designation: G90 (Z275).
   2. Exposed-Surface Finish: Mill phosphatized.

C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for ducts and finish for exposed ducts.

D. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

E. Extruded Aluminum: Comply with ASTM B 221 (ASTM B 221M), Alloy 6063, Temper T6.

F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

G. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, , the following:

1. Greenheck Fan Corporation.
2. Nailor Industries Inc.
3. Ruskin Company.

B. Description: Motorized.

C. Maximum Air Velocity: 2000 fpm (10 m/s).

D. Maximum System Pressure: 2-inch wg (0.25 kPa).

E. Frame: 0.063-inch- (1.6-mm-) thick extruded aluminum with welded corners..

F. Blades: Multiple single-piece blades, maximum 6-inch (150-mm) width, 0.050-inch- (1.2-mm-) thick aluminum sheet with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Extruded vinyl, mechanically locked.

I. Blade Axles:

1. Material: Stainless steel.
2. Diameter: 0.20 inch (5 mm).

J. Tie Bars and Brackets: Aluminum.

K. Return Spring: Adjustable tension.

L. Bearings: Synthetic pivot bushings.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Screen Mounting: Front mounted in sleeve.
   a. Sleeve Thickness: 20-gage (1.0-mm) minimum.
   b. Sleeve Length: 6 inches (152 mm) minimum.
6. Screen Mounting: Rear mounted.
7. Screen Material: Aluminum.
8. Screen Type: Insect.
9. 90-degree stops.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, the following:
   a. METALAIRE, Inc.
   b. Nailor Industries Inc.
   c. Ruskin Company.
2. Standard leakage rating.
3. Suitable for horizontal or vertical applications.
4. Frames:
   a. Hat-shaped, galvanized-steel channels, 0.064-inch (1.62-mm) minimum thickness.
   b. Mitered and welded corners.
   c. Flanges for attaching to walls and flangeless frames for installing in ducts.
5. Blades:
   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Galvanized-steel, 0.064 inch (1.62 mm) thick.
6. Blade Axles: Galvanized steel.
7. Bearings:
   a. Molded synthetic.
   b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Galvanized steel.

B. Standard, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, the following:
   a. METALAIRE, Inc.
   b. Nailor Industries Inc.
   c. Ruskin Company.
2. Standard leakage rating.
3. Suitable for horizontal or vertical applications.
4. Frames: Hat-shaped, 0.10-inch- (2.5-mm-) thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:
   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Roll-Formed Aluminum Blades: 0.10-inch- (2.5-mm-) thick aluminum sheet.
   e. Extruded-Aluminum Blades: 0.050-inch- (1.2-mm-) thick extruded aluminum.
6. Blade Axles: Nonferrous metal.
7. Bearings:
   a. Molded synthetic.
   b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
8. Tie Bars and Brackets: Aluminum.

C. Jackshaft:

1. Size: 1-inch (25-mm) diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

D. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.4 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.5 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1. Ductmate Industries, Inc.

2. Duro Dyne Inc.
3. METALAIRE, Inc.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

E. Vane Construction: Double wall.

F. Vane Construction: Single wall for ducts up to 48 inches (1200 mm) wide and double wall for larger dimensions.

2.6 REMOTE DAMPER OPERATORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Pottorff; a division of PCI Industries, Inc.
2. Ventfabrics, Inc.
3. Young Regulator Company.

B. Description: Cable system designed for remote manual damper adjustment.

C. Tubing: Brass.

D. Cable: Stainless steel.

E. Wall-Box Mounting: Recessed, 3/4 inches (19 mm) deep].

F. Wall-Box Cover-Plate Material: Steel

2.7 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following
1. Ductmate Industries, Inc.
2. Greenheck Fan Corporation.
3. Nailor Industries Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:
   a. Double wall, rectangular.
   b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
   c. Vision panel.
   d. Hinges and Latches: 1-by-1-inch (25-by-25-mm) butt or piano hinge and cam latches.
   e. Fabricate doors airtight and suitable for duct pressure class.
2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:
   a. Access Doors Less Than 12 Inches (300 mm) Square: No hinges and two sash locks.
   b. Access Doors up to 18 Inches (460 mm) Square: Two hinges and two sash locks.
   c. Access Doors up to 24 by 48 Inches (600 by 1200 mm): Three hinges and two compression latches
   d. Access Doors Larger Than 24 by 48 Inches (600 by 1200 mm): Four hinges and two compression latches with outside and inside handles.

2.8 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0428-inch (1.1-mm) stainless steel.

D. Fasteners: Stainless steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F (1093 deg C).

F. Minimum Pressure Rating: 10-inch wg (2500 Pa), positive or negative.

2.9 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following]:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ventfabrics, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 5-3/4 inches (146 mm) wide attached to 2 strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

F. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.

1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch (6-mm) movement at start and stop.

2.10 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.

1. Pressure Rating: 10-inch wg (2500 Pa) positive and 1.0-inch wg (250 Pa) negative.
2. Maximum Air Velocity: 4000 fpm (20 m/s).
3. Temperature Range: Minus 10 to plus 160 deg F (Minus 23 to plus 71 deg C).
4. Insulation R-value: Comply with ASHRAE/IESNA 90.1-2004

C. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches (75 through 460 mm), to suit duct size.

2.11 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Connect ducts to duct silencers rigidly.

H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream and downstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.

5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. At each change in direction and at maximum 50-foot (15-m) spacing.
8. Upstream and downstream from turning vanes.
9. Upstream or downstream from duct silencers.
10. Control devices requiring inspection.
11. Elsewhere as indicated.

I. Install access doors with swing against duct static pressure.

J. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
5. Body Access: 25 by 14 inches (635 by 355 mm).
6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).

K. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

L. Install flexible connectors to connect ducts to equipment.

M. For fans developing static pressures of 5-inch wg (1250 Pa) and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

N. Connect terminal units to supply ducts directly or with maximum 12-inch (300-mm) lengths of flexible duct. Do not use flexible ducts to change directions.

O. Connect diffusers or light troffer boots to ducts directly or with maximum 60-inch (1500-mm)lengths of flexible duct clamped or strapped in place.

P. Connect flexible ducts to metal ducts with draw bands

Q. Install duct test holes where required for testing and balancing purposes.

R. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch (6-mm) movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.

2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.
5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 23 33 00

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SECTION 23 34 23 - GENERAL EXHAUST FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Upblast & Downblast Centrifugal roof exhaust fans.
2. Square In-line centrifugal fans.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on actual Project site elevations.

B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For unit hangars and supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
2. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.

D. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension assembly members.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

E. Field quality-control reports.

F. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.6 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One set(s) for each belt-driven unit.

PART 2 - PRODUCTS

2.1 UPBLASTB & DOWNBLAST CENTRIFUGAL ROOF EXHAUST FANS

A. Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Greenheck Fan Corporation.
2. Hartzell Fan Incorporated.
3. New York Blower Company (The).

B. Wind Band, Fan Housing, and Base: Reinforced and braced aluminum, containing butterfly dampers and rain trough, motor and drive assembly, and fan wheel.

1. Damper Rods: Steel with bronze bearings.
2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.

C. Fan Wheel: Replaceable, cast-aluminum, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.

D. Belt Drives:

1. Resiliently mounted to housing.
2. Weatherproof housing of same material as fan housing.
3. Fan Shaft: Turned, ground, and polished steel; keyed to wheel hub.
4. Shaft Bearings: Prelubricated and sealed, self-aligning, pillow-block-type ball bearings.
5. Pulleys: Cast-iron, adjustable-pitch motor pulley.
6. Motor Mount: On outside of fan cabinet, adjustable base for belt tensioning.

E. Roof Curbs: Galvanized steel; mitered and welded corners; 1-1/2-inch- (40-mm-) thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Built-in cant and mounting flange.
2. Overall Height: 12 inches (300 mm).
3. Sound Curb: Curb with sound-absorbing insulation.
4. Pitch Mounting: Manufacture curb for roof slope.
5. Metal Liner: Galvanized steel.
6. Mounting Pedestal: Galvanized steel with removable access panel.

F. Capacities and Characteristics:

1. Airflow: Refer to Exhaust Fan Schedule on drawing H-801.
2. External Static Pressure: Refer to Exhaust Fan Schedule on drawing H-801
3. Fan Diameter: Refer to Exhaust Fan Schedule on drawing H-801
4. Drive Arrangement: Direct.
5. Fan rpm: Refer to Exhaust Fan Schedule on drawing H-801
6. Tip Speed: Refer to Exhaust Fan Schedule on drawing H-801
7. Sound: Refer to Exhaust Fan Schedule on drawing H-801
8. Curb Size: Refer to Exhaust Fan Schedule on drawing H-801
9. Curb Height: Refer to Exhaust Fan Schedule on drawing H-801

10. Damper: Yes.
11. Damper Size: Refer to Exhaust Fan Schedule on drawing H-801
12. Brake Horsepower: Refer to Exhaust Fan Schedule on drawing H-801
13. Motor Size: Refer to Exhaust Fan Schedule on drawing H-801
14. Motor rpm: Refer to Exhaust Fan Schedule on drawing H-801
15. Electrical Characteristics:
    a. Volts: Refer to Exhaust Fan Schedule on drawing H-801
    b. Phase: Refer to Exhaust Fan Schedule on drawing H-801
    c. Hertz: Refer to Exhaust Fan Schedule on drawing H-801

2.2 SQUARE IN-LINE CENTRIFUGAL FANS

A. Manufacturers: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Greenheck Fan Corporation.
2. Hartzell Fan Incorporated.
3. JencoFan.

B. Housing: Galvanized steel, inlet and outlet flanges, mounted directly to the ductwork.

C. Direct-Drive Units: Motor mounted in airstream, factory wired to disconnect switch located on outside of fan housing; with wheel, inlet cone, and motor on swing-out service door.

D. Fan Wheels: Aluminum, airfoil blades welded to aluminum hub.

E. Accessories:

1. Variable-Speed Controller: Solid-state control to reduce speed from 100 to less than 50 percent.
2. Volume-Control Damper: Manually operated with quadrant lock, located in fan outlet.
3. Companion Flanges: For inlet and outlet duct connections.
4. Fan Guards: 1/2- by 1-inch (13- by 25-mm) mesh of galvanized steel in removable frame. Provide guard for inlet or outlet for units not connected to ductwork.
5. Motor and Drive Cover (Belt Guard): Epoxy-coated steel.

F. Capacities and Characteristics:

1. Airflow: Refer to Exhaust Fan Schedule on drawing H-801
2. External Static Pressure: Refer to Exhaust Fan Schedule on drawing H-801
3. Fan Diameter: Refer to Exhaust Fan Schedule on drawing H-801
4. Wheel Type: Backward inclined.
5. Fan rpm: Refer to Exhaust Fan Schedule on drawing H-801
6. Outlet Velocity: Refer to Exhaust Fan Schedule on drawing H-801
7. Brake Horsepower: Refer to Exhaust Fan Schedule on drawing H-801
8. Motor Size: Refer to Exhaust Fan Schedule on drawing H-801hp.
9. Electrical Characteristics:
    a. Volts: Refer to Exhaust Fan Schedule on drawing H-801
    b. Phase: Refer to Exhaust Fan Schedule on drawing H-801
    c. Hertz: Refer to Exhaust Fan Schedule on drawing H-801

10. Vibration Isolators:

a. Type: Elastomeric hangers.
b. Static Deflection: 1 inch (25 mm).

2.3 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

B. Enclosure Type: Totally enclosed, fan cooled.

2.4 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Division 07 Section "Roof Accessories" for installation of roof curbs.

C. Ceiling Units: Suspend units from structure; use steel wire or metal straps.

D. Support suspended units from structure using threaded steel rods and elastomeric hangers having a static deflection of 1 inch (25 mm). Vibration-control devices are specified in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment."

E. Install units with clearances for service and maintenance.

F. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 23 Section "Air Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION 233423

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SECTION 23 34 33 - HVAC KITCHEN EXHAUST FANS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Upblast Centrifugal roof exhaust fans.

1.3 PERFORMANCE REQUIREMENTS

A. Project Altitude: Base fan-performance ratings on actual Project site elevations.

B. Operating Limits: Classify according to AMCA 99.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and furnished specialties and accessories. Also include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material thickness and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.
6. Roof curbs.
7. Fan speed controllers.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For unit hangars and supports indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.
2. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.

D. Coordination Drawings: Reflected ceiling plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Roof framing and support members relative to duct penetrations.
2. Ceiling suspension assembly members.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including light fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

E. Field quality-control reports.

F. Operation and Maintenance Data: For power ventilators to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. AMCA Compliance: Fans shall have AMCA-Certified performance ratings and shall bear the AMCA-Certified Ratings Seal.

C. UL Standards: Power ventilators shall comply with UL 705. Power ventilators for use for restaurant kitchen exhaust shall also comply with UL 762.

1.6 COORDINATION

A. Coordinate size and location of structural-steel support members.

B. Coordinate sizes and locations of concrete bases with actual equipment provided.

C. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PART 2 - PRODUCTS

2.1 UPBLAST CENTRIFUGAL ROOF EXHAUST FANS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Greenheck Fan Corporation.
2. Hartzell Fan Incorporated.
3. New York Blower Company (The).

C. Wind Band, Fan Housing, and Base: Reinforced and braced heavy gauge aluminum, containing butterfly dampers and rain trough, motor and drive assembly, and fan wheel.

1. Damper Rods: Steel with bronze bearings.
2. Hinged Subbase: Galvanized-steel hinged arrangement permitting service and maintenance.

D. Fan Wheel: Replaceable, cast-aluminum, airfoil blades fastened to cast-aluminum hub; factory set pitch angle of blades.

E. Roof Curbs: 20 gauge steel complying with UL705/ 762 and ULC-S645 for kitchen exhaust fans; mitered and welded corners; 1-1/2-inch- (40-mm-) thick, rigid, fiberglass insulation adhered to inside walls; and 1-1/2-inch (40-mm) wood nailer. Size as required to suit roof opening and fan base.

1. Configuration: Built-in cant and mounting flange.
2. Overall Height: 12 inches (300 mm).
3. Sound Curb: Curb with sound-absorbing insulation.
4. Pitch Mounting: Manufacture curb for roof slope.
5. Metal Liner: 20 Gauge steel.
6. Mounting Pedestal: 20-gauge steel with removable access panel.
7. Welded grease spout complying with UL705/762.

F. Capacities and Characteristics:

1. Airflow: Refer to Exhaust Fan Schedule on drawing H-801.
2. External Static Pressure: Refer to Exhaust Fan Schedule on drawing H-801
3. Fan Diameter: Refer to Exhaust Fan Schedule on drawing H-801
4. Drive Arrangement: Direct.
5. Fan rpm: Refer to Exhaust Fan Schedule on drawing H-801
6. Tip Speed: Refer to Exhaust Fan Schedule on drawing H-801
7. Sound: Refer to Exhaust Fan Schedule on drawing H-801
8. Curb Size: Refer to Exhaust Fan Schedule on drawing H-801
9. Curb Height: Refer to Exhaust Fan Schedule on drawing H-801
10. Damper: No.
11. Damper Size: Refer to Exhaust Fan Schedule on drawing H-801
12. Brake Horsepower: Refer to Exhaust Fan Schedule on drawing H-801
13. Motor Size: Refer to Exhaust Fan Schedule on drawing H-801

14. Motor rpm: Refer to Exhaust Fan Schedule on drawing H-801
15. Electrical Characteristics:
    a. Volts: Refer to Exhaust Fan Schedule on drawing H-801
    b. Phase: Refer to Exhaust Fan Schedule on drawing H-801
    c. Hertz: Refer to Exhaust Fan Schedule on drawing H-801

2.2 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
2. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.

B. Enclosure Type: Totally enclosed, fan cooled.

2.3 SOURCE QUALITY CONTROL

A. Certify sound-power level ratings according to AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Certify fan performance ratings, including flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests according to AMCA 210, "Laboratory Methods of Testing Fans for Aerodynamic Performance Rating." Label fans with the AMCA-Certified Ratings Seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install power ventilators level and plumb.

B. Secure roof-mounted fans to roof curbs with cadmium-plated hardware. See Division 07 Section "Roof Accessories" for installation of roof curbs.

C. Install units with clearances for service and maintenance.

D. Label units according to requirements specified in Division 23 Section "Identification for HVAC Piping and Equipment."

3.2 CONNECTIONS

A. Duct installation and connection requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with stainless steel duct.

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Adjust belt tension.
6. Adjust damper linkages for proper damper operation.
7. Verify lubrication for bearings and other moving parts.
8. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
9. Disable automatic temperature-control operators, energize motor and adjust fan to indicated rpm, and measure and record motor voltage and amperage.
10. Shut unit down and reconnect automatic temperature-control operators.
11. Remove and replace malfunctioning units and retest as specified above.

C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Prepare test and inspection reports.

3.4 ADJUSTING

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing procedures.

D. Replace fan and motor pulleys as required to achieve design airflow.

E. Lubricate bearings.

END OF SECTION 23 34 23

SECTION 23 36 00

AIR TERMINAL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Shutoff, single-duct air terminal units.

1.3 PERFORMANCE REQUIREMENTS

A. Structural Performance: Hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7

1.4 SUBMITTALS

A. Product Data: For each type of the following products, including rated capacities, furnished specialties, sound-power ratings, and accessories.

1. Air terminal units.
2. Liners and adhesives.
3. Sealants and gaskets.

B. LEED Submittal:

1. Product Data for Prerequisite EQ 1: Documentation indicating that units comply with ASHRAE 62.1-2004, Section 5 - "Systems and Equipment."

C. Shop Drawings: For air terminal units. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.
3. Hangers and supports, including methods for duct and building attachment and vibration isolation.

D. Delegated-Design Submittal:

1. Materials, fabrication, assembly, and spacing of hangers and supports.
2. Design Calculations: Calculations for selecting hangers and supports

E. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension assembly members.
2. Size and location of initial access modules for acoustic tile.
3. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.

F. Field quality-control reports.

G. Operation and Maintenance Data: For air terminal units to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Instructions for resetting minimum and maximum air volumes.
2. Instructions for adjusting software set points.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

PART 2 - PRODUCTS

2.1 SHUTOFF, SINGLE-DUCT AIR TERMINAL UNITS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide Titus or comparable product by one of the following:

1. Krueger.
2. Price Industries.
3. Titus.

C. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.

D. Casing: 0.034-inch (0.85-mm) steel, single wall.

1. Casing Lining: Adhesive attached, 1/2-inch- (13-mm-) thick, coated, fibrous-glass duct liner complying with ASTM C 1071, and having a maximum flame-spread index of 25 and a maximum smoke-developed index of 50, for both insulation and adhesive, when tested according to ASTM E 84.
   a. Cover liner with nonporous foil.
   b. Cover liner with nonporous foil and perforated metal.
2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
3. Air Outlet: S-slip and drive connections
4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

E. Regulator Assembly: System-air-powered bellows section incorporating polypropylene bellows for volume regulation and thermostatic control. Bellows shall operate at temperatures from 0 to 140 deg F (minus 18 to plus 60 deg C), shall be impervious to moisture and fungus, shall be suitable for 10-inch wg (2500-Pa) static pressure, and shall be factory tested for leaks.

F. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.

1. Maximum Damper Leakage: ARI 880 rated, 2 percent of nominal airflow at 6-inch wg (1500-Pa) inlet static pressure.
2. Damper Position: Normally open.

G. Hydronic Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch (2.5 mm), and rated for a minimum working pressure of 200 psig (1380 kPa) and a maximum entering-water temperature of 220 deg F (104 deg C). Include manual air vent and drain valve.

H. Electric Controls: Damper actuator and thermostat (Furnished by BMS Contractor and Installed by Mechanical Contractor)

1. Damper Actuator: 24 V, powered closed, powered open
2. Thermostat: Wall-mounted electronic type with clock display, temperature display in Fahrenheit and Celsius, and space temperature set point.
3. Provide 24V control transformer accessory for each terminal unit.

I. Control Sequence:

1. Suitable for operation with duct pressures between 0.25- and 3.0-inch wg (60- and 750-Pa) inlet static pressure.
2. System-powered, wall-mounted thermostat.
3. Refer to controls drawing H-503 for points list. All controls are to be fully integrated into the Siemens BMS.

2.2 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Steel Cables: Stainless steel complying with ASTM A 492.

D. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

E. Air Terminal Unit Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

F. Trapeze and Riser Supports: Steel shapes and plates for units with steel casings; aluminum for units with aluminum casings.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test assembled air terminal units according to ARI 880.

1. Label each air terminal unit with plan number, nominal airflow, maximum and minimum factory-set airflows, coil type, and ARI certification seal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."

B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.

C. Install wall-mounted thermostats.

3.2 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes and for slabs more than 4 inches (100 mm) thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes and for slabs less than 4 inches (100 mm) thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hangers Exposed to View: Threaded rod and angle or channel supports.

D. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.3 CONNECTIONS

A. Install piping adjacent to air terminal unit to allow service and maintenance.

B. Hot-Water Piping: In addition to requirements in Division 23 Section "Hydronic Piping," connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.

C. Connect ducts to air terminal units according to Division 23 Section "Metal Ducts."

D. Make connections to air terminal units with flexible connectors complying with requirements in Division 23 Section "Air Duct Accessories."

3.4 IDENTIFICATION

A. Label each air terminal unit with plan number, nominal airflow, and maximum and minimum factory-set airflows. Comply with requirements in Division 23 Section "Identification for HVAC Piping and Equipment" for equipment labels and warning signs and labels.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

C. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

D. Tests and Inspections:

1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Air terminal unit will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

3.6 STARTUP SERVICE

A. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Verify that inlet duct connections are as recommended by air terminal unit manufacturer to achieve proper performance.
3. Verify that controls and control enclosure are accessible.
4. Verify that control connections are complete.
5. Verify that nameplate and identification tag are visible.
6. Verify that controls respond to inputs as specified.

3.7 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

END OF SECTION 23 36 00

SECTION 23 37 13 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Rectangular and square ceiling diffusers.
2. Linear slot diffusers.
3. Adjustable bar registers and grilles.
4. Fixed face registers and grilles.

B. Related Sections:

1. Division 08 Section "Louvers and Vents" for fixed and adjustable louvers and wall vents, whether or not they are connected to ducts.
2. Division 23 Section "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples for Initial Selection: For diffusers, registers, and grilles with factory-applied color finishes.

C. Samples for Verification: For diffusers, registers, and grilles, in manufacturer's standard sizes to verify color selected.

D. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from Installers of the items involved:

1. Ceiling suspension assembly members.
2. Method of attaching hangers to building structure.
3. Size and location of initial access modules for acoustical tile.
4. Ceiling-mounted items including lighting fixtures, diffusers, grilles, speakers, sprinklers, access panels, and special moldings.
5. Duct access panels.

E. Source quality-control reports.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

A. Rectangular and Square Ceiling Diffusers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include,the following:
   a. Krueger.
   b. Price Industries.
   c. Titus.
2. Material: Aluminum.
3. Finish: Baked enamel, white.
4. Face Size: 24 by 24 inches (600 by 600 mm).
5. Face Style: Three cone.
6. Mounting: Surface or T-bar as required.
7. Pattern: Fixed.
8. Accessories:
   a. Equalizing grid.
   b. Plaster ring.
   c. Safety chain.
   d. Wire guard.
   e. Sectorizing baffles.
   f. Operating rod extension.

2.2 CEILING LINEAR SLOT OUTLETS

A. Linear Slot Diffuser:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, the following:
   a. Krueger.
   b. Price Industries.
   c. Titus.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material - Shell: Aluminum.
4. Material - Pattern Controller and Tees: Aluminum.
5. Finish - Face and Shell: Baked enamel, white.
6. Finish - Pattern Controller: Baked enamel, white.
7. Finish - Tees: Baked enamel, white.
8. Slot Width: As scheduled.
9. Number of Slots: As scheduled.
10. Length: As scheduled
11. Accessories: T-bar clip on both sides.

2.3 REGISTERS AND GRILLES

A. Adjustable Bar Register:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include,the following:
   a. Krueger.
   b. Price Industries.
   c. Titus.
2. Material: Aluminum.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Horizontal.
5. Core Construction: Removable.
6. Rear-Blade Arrangement: Vertical.
7. Frame: 1-1/4 inches (32 mm) wide.
8. Mounting: As shown on plans.
9. Damper Type: Adjustable opposed blade.
10. Accessories:
    a. Front-blade gang operator.

B. Adjustable Bar Grille:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, the following:
   a. Krueger.
   b. Price Industries.
   c. Titus.
2. Material: Aluminum.
3. Finish: Baked enamel, white.
4. Face Blade Arrangement: Horizontal.
5. Core Construction: Removable.
6. Rear-Blade Arrangement: Vertical.
7. Frame: 1-1/4 inches (32 mm) wide.
8. Mounting: As shown on plans.
9. Damper Type: Adjustable opposed blade.

C. Fixed Face Register:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, the following:
   a. Krueger.
   b. Price Industries.
   c. Titus.
2. Material: Aluminum.
3. Finish: Baked enamel, white.
4. Face Arrangement: 1/2-by-1/2-by-1/2-inch (13-by-13-by-13-mm) grid.
5. Core Construction: Removable.
6. Frame: 1-1/4 inches (32 mm) wide.
7. Mounting: As shown on plans.
8. Damper Type: Adjustable opposed blade.

D. Fixed Face Grille:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, , the following:
   a. Krueger.
   b. Price Industries.
   c. Titus.

2. Material: Aluminum.
3. Finish: Baked enamel, white.
4. Face Arrangement: 1/2-by-1/2-by-1/2-inch (13-by-13-by-13-mm) grid.
5. Core Construction: Removable.
6. Frame: 1-1/4 inches (32 mm) wide.
7. Mounting: As shown on plans.
8. Damper Type: Adjustable opposed blade.

2.4 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 23 37 13

SECTION 235700 - HEAT EXCHANGERS FOR HVAC

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes plate heat exchangers.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories.

B. Shop Drawings: Signed and sealed by a qualified professional engineer. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   1. Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.

C. Coordination Drawings: Equipment room, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

   1. Tube-removal space.
   2. Structural members to which heat exchangers will be attached.

D. Operation and Maintenance Data: For heat exchangers to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, performance, and dimensional requirements of heat exchangers and are based on the specific equipment indicated. Refer to Division 01 Section "Product Requirements."

B. ASME Compliance: Fabricate and label heat exchangers to comply with ASME Boiler and Pressure Vessel Code: Section VIII, "Pressure Vessels," Division 1.

C. Registration: Fabricate and label shell-and-tube heat exchangers to comply with the Tubular Exchanger Manufacturers Association's standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 GASKETED PLATE HEAT EXCHANGERS

A. Available Manufacturers:

   1. Alfa Laval Thermal, Inc.
   2. API Heat Transfer Inc.
   3. Armstrong Pumps, Inc.

B. Configuration: Packaged assembly consisting of frame support, top and bottom carrying and guide bars, fixed and movable end plates, tie rods, individually removable plates, and one-piece gaskets, Pumps, Expansion tank, and air separator.

C. Frame:

   1. Capacity to accommodate 20percent additional plates.
   2. Painted carbon steel with provisions for anchoring to support.

D. End-Plate Material: Painted carbon steel.

E. Tie Rods and Nuts: Steel or stainless steel.

F. Plate Material: 0.016 inch (0.4 mm)thick before stamping; Alloy.

G. Gasket Material: Nitrile rubber.

H. Piping Connections:

   1. Threaded port for NPS 2 (DN 50) and smaller. For larger sizes, furnish end-plate port with threaded studs suitable for flanged connection.
   2. End plate with welded carbon-steel nozzles. Threaded pipe connection for NPS 2 (DN 50) and smaller; carbon-steel flanged pipe connection for larger sizes.
   3. Line wetted surfaces with same material as plates.

I. Enclose plates in a solid aluminum removable shroud.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas for compliance with requirements for installation tolerances and for structural rigidity, strength, anchors, and other conditions affecting performance of heat exchangers.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 HEAT-EXCHANGER INSTALLATION

A. Concrete Bases: Anchor heat exchanger to concrete base.

1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around full perimeter of base.
2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
4. Install anchor bolts to elevations required for proper attachment to supported equipment.
5. Cast-in-place concrete materials and placement requirements are specified in Division 03.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Maintain manufacturer's recommended clearances for service and maintenance. Install piping connections to allow service and maintenance of heat exchangers.

C. Install shutoff valves at heat-exchanger inlet and outlet connections.

D. Install relief valves on heat-exchanger heated-fluid connection and install pipe relief valves, full size of valve connection, to floor drain.

E. Install vacuum breaker at heat-exchanger steam inlet connection.

F. Install hose end valve to drain shell.

3.4 FIELD QUALITY CONTROL

A. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

3.5 CLEANING

A. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

3.6 DEMONSTRATION

A. Train Owner's maintenance personnel to adjust, operate, and maintain heat exchangers. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 23 57 00

SECTION 23 64 13 GROUND LOOP HEAT EXCHANGER SYSTEM

PART 1 - GENERAL

1.1 DESCRIPTION

A. The requirements of this Section apply to all sections of Division 23 related to ground-source heat pump systems.

1.2 RELATED WORK

A. Section 01 00 00, GENERAL REQUIREMENTS

B. Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA, AND SAMPLES

C. Section 01 91 00, GENERAL COMMISSIONING REQUIREMENTS

D. Section 23 05 11, COMMON WORK RESULTS FOR HVAC

E. Section 23 05 93 TESTING, ADJUSTING AND BALANCING FOR HVAC

F. Section 23 07 19, HVAC PIPING INSULATION

G. Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS

H. Section 23 09 00, INSTRUMENTATION AND CONTROL FOR HVAC

I. Section 23 21 13, HYDRONIC PIPING

J. Section 23 21 23, HYDRONIC PUMPS

K. Section 23 25 00, HVAC WATER TREATMENT

K. Section 23 64 23, WATER-SOURCE MODULAR HEATING AND COOLING SYSTEM

1.3 DEFINITIONS

A. Unless otherwise specified or indicated, ground source heat pump terms used in these specifications, and on the drawings, shall be defined in AHRI 330.

1.4 QUALITY ASSURANCE

A. The wellbore driller and installer of downhole piping shall be accredited by the International Ground Source Heat Pump Association (IGSHPA), or an equivalent accreditation or certification from a nationally-recognized association.

B. Local and state laws and ordinances as they pertain to buried pipe systems shall be strictly followed or a variance obtained.

C. Installer(s) shall demonstrate that they have successfully installed at least four projects that, in aggregate, equal or exceed the size of the proposed project. References shall be provided for each of these installed projects.

1.5 PERMITS AND FEES

A. The wellbore driller/installer of downhole piping shall, without additional expense, be responsible for obtaining and paying for any and all necessary licenses and permits in connection with the performance of its services; installer shall maintain said licenses and permits current until the work has been accepted by the Government, and alone shall bear financial responsibility for any and all violations of said licenses and permits

1.6 SUBMITTALS

A. Per Division 01.

B. Contractor shall make all necessary field measurements and investigations to assure that the equipment and assemblies will meet contract requirements.

C. If equipment submitted differs in arrangement from that shown on the submittals, provide drawings that show the rearrangement of all associated systems. Approval will be given only if all features of the equipment and associated systems, including accessibility, are equivalent to that required by the contract and acceptable to the Engineer.

D. Prior to submitting shop drawings for approval, contractor shall certify in writing that manufacturers of all major items of equipment have each reviewed drawings and specifications from the applicable other manufacturers, and have jointly coordinated and properly integrated their equipment and controls to provide a complete and efficient installation.

E. Submittals and shop drawings for independent items, containing applicable descriptive information, shall be furnished together and complete in a group. Coordinate and properly integrate materials and equipment in each group to provide a completely compatible and efficient installation. Final review and approvals will be made only on complete groups.

F. Shop Drawings: Include heat pump equipment structural supports, control sequences, monitoring instruments and controls, interconnections and all other components, parts and pieces required to complete the functioning assembly. Where applicable, include shop drawings for foundations or other support structures.

G. Product Data: Include detailed information for components of the ground-source heat pump system.

1. Geothermal Source Well and Grouts
2. Wiring
3. Wiring Specialties
4. Valves
5. Piping and Piping Specialties
6. Header Assemblies
7. Heat Transfer Fluid
8. Heat Exchanger
9. Insulation

10. Instrumentation consisting of monitoring systems and control systems compatible with the facility's existing data and control systems.

H. Certificates: Submit technical representative's certification that the installation has been implemented as intended by the system designer and where applicable, recommended by the manufacturer.

I. Manufacturer's Instructions.

J. Operation and Maintenance Ground-Source Heat Pump System Data Package:

1. Safety precautions
2. Operator restart
3. Startup, shutdown, and post-shutdown procedures
4. Normal operations
5. Emergency operations
6. Operator service requirements
7. Environmental conditions
8. Lubrication data
9. Preventive maintenance plan and schedule
10. Cleaning recommendations
11. Troubleshooting guides and diagnostic techniques
12. Wiring and control diagrams
13. Maintenance and repair procedures
14. Removal and replacement instructions
15. Spare parts and supply list
16. Corrective maintenance man-hours
17. Product submittal data
18. O&M submittal data
19. Parts identification
20. Warranty information
21. Personnel training requirements
22. Testing equipment and special tool information
23. Testing and performance data
24. Contractor information

K. Closeout Submittals:

1. Posted operating instructions for ground-source heat pump system that provide for wiring identification codes and diagrams, operating instructions, control matrix, and troubleshooting instructions.
2. As-built drawings of geo-heat exchange field wells, piping locations, and distribution system provided on no less than 3/16" scale drawings in AutoCAD .DWG digital file format.

PART 2 – PRODUCTS

2.1 GENERAL

A. Provide factory-prefabricated ground-source heat pump equipment packages which meet the requirements of this section.

2.2 DOWNHOLE HEAT EXCHANGER PIPING AND SPECIALTIES

A. The acceptable pipe and fitting materials for the underground portion of the ground heat exchanger geothermal well field shall be high density polyethylene (HDPE).

B. Polyethylene heat exchanger shall meet the following requirements:

1. Pipe and heat fused materials shall be manufactured from virgin polyethylene extrusion compound material per ASTM D-2513, Section 4.1 and 4.2. Pipe shall be manufactured to outside diameters, wall thickness, and respective tolerances as specified in ASTM, D-3035 or F-714. Fittings shall be manufactured to diameters, wall thickness, and respective tolerances as specified in ASTM D-3261 for butt-fusion fittings, ASTM D-2683 for socket fusion fittings and ASTM F-1055 for electro-fusion fittings.
2. The material shall have a Hydrostatic Design Basis of 11 MPa [1600 psi] at 23°C [73°F] per ASTM D-2837. The material shall be listed in PPI TR4 as either a PE 3408/3608 or PE 4710 piping formulation. The material shall be a high-density polyethylene compound having a minimum cell classification of PE345464C per ASTM D-3350.
3. The total system pressure shall remain below the working pressure of the pipe.
4. Sufficient information shall be permanently marked on the length of the pipe as defined by the appropriate ASTM pipe standard.
5. Manufacturer shall supply a notarized document confirming compliance with the above standards.

2.3 DOWNHOLE HEAT EXCHANGER WELL CONFIGURATION

A. Each well shall be 6 inches in diameter, spaced a minimum of 20 ft apart and at a depth of 750 ft.

B. Install schedule 80 steel well casing at the top of each well. Minimum depth shall be determined in the field based on drilling conditions.

C. Pack well with high performance geo-exchange grout, with the minimum thermal conductivity of 1.6 BTU/H-FL-F.

D. Grout shall be a precise mixture of water, sand, and bentonite to achieve the thermal conductivity of 1.6.

E. Grout mixture should swell 5-8% against the well wall, to seal against aquifer cross-contamination or surface water penetration.

2.4 HEAT TRANSFER FLUID

A. Shall meet local and state requirements and be acceptable by component manufacturers.

B. Shall meet requirements of ICC IMC Section 1207.

C. The ground-source heat pump system shall have a permanent label at the loop charging valve identifying the antifreeze type and concentration, service date, and the name and phone number of the service company.

D. Heat transfer fluids used shall be the following:

1. Food-grade 15% propylene glycol-water solution mixed with biocide glutaraldehyde at a concentration specified by the product manufacturer.

2. Nontoxic compounds meeting IGSHPA #21035, Sections 3B and 3C, and which are compatible with heat pump manufacturers' specifications.

E. The fluid shall conform to the following requirements, and tests shall be performed in accordance with specified test methods on the fluid:

1. Flash point shall not be lower than 90°C [194°F], determined in accordance with ASTM D-92.
2. Five days biological oxygen demand (BOD) at 10°C [50°F] shall not exceed 0.2 gram oxygen per gram not be less than 0.1 gram oxygen per gram.
3. Freezing point shall not exceed -8°C [+18°F], determined in accordance with ASTM D-1177.
4. Toxicity shall not be less than LD 50 (oral-rats) of 5 grams per kilogram. The NFPA 704 hazardous material rating for health shall not be more than 1 (slight).
5. The fluid, tested in accordance with ASTM F-1105, shall show neither separation from exposure to heat or cold, nor show an increase in turbidity.

F. The fluid, as received by the purchaser, shall be homogeneous, uniform in color, and free from skins, lumps, and foreign materials detrimental to usage of the fluid.

G. Water used to dilute the antifreeze heat transfer fluids shall be of potable quality. Final heat transfer fluid solutions shall not be flammable.

H. Vertical Closed Loops for direct exchange geothermal system shall use only a non-ozone depleting refrigerant, or an equally safe refrigerant as specified by the heat pump manufacturer, as a heat transfer fluid.

I. Isolation and Balancing Valves:

1. Each incoming loop leg shall be isolatable by manual shut off valves with a balancing valve on the return line to regulate the flow. The main loop supply and return lines shall contain manual or powered isolation valves. There shall be access ports in the main loop supply and return lines to allow for loop flushing.

J. Packaging and Identification:

1. Fluid shall be packaged in containers of a type and size agreed upon by purchaser and vendor, or shall be delivered in bulk, as ordered.
2. Containers of fluid shall be prepared for shipment in accordance with commercial practice and in compliance with applicable rules and regulations pertaining to the handling, packaging, and transportation of the fluid to ensure carrier acceptance and safe delivery.
3. An up-to-date Material Safety Data Sheet (MSDS) shall be supplied to each purchaser on request and concurrent with each delivery.

2.6 PIPING INSULATION

A. Comply with Division 23-07-19.

2.7 MANIFOLD VAULT CONFIGURATION

A. Build a 10ft x 8ft concrete vault that is 7ft deep in the location indicated on drawing HS-101.

B. Vault shall be fully enclosed with a door or hatch on the top to provide access into the vault.

C. Install (2) 5” schedule 40 steel pipe headers for the ground source supply and return loops.

D. Each manifold will have a total of (10) 2” pipe connections from the wells.

E. Refer to contract drawings HS-101 and H-706 for piping and valve configuration.

2.8 INSTRUMENTATION

A. Comply with HYDRONIC PIPING Section, for pressure gauge and thermometer requirements. Use corrosion resistant materials for wetted parts of instruments.

B. Pressure Gages: ASME B40.100, brass body, and minimum 90 mm [3.5 inches] diameter dial face.

C. Thermometers: ASTM E1, liquid-in-glass type or dial type, liquid-filled tube and bulb.

D. Monitoring System:

1. Kilojoule Btu Meter: Sensing and Monitoring device to measure and display the heat energy produced by the ground-source heat pump system, with minimum sensitivity of 0.5 percent over the entire scale. Provide electromechanical kJ Btu counter plus digital-panel meter indicating sensor temperatures, differential temperature, flow rate, and watt Btu per minute or hour.
2. Water and Heat Transfer Fluid Leak Detection: UL-listed system consisting of a sensor probe, control panel, and LED indicators for water; yellow, and heat transfer fluid; red, with audible alarm at minimum 75 dB sound level; reference 10 exponential minus 12 watts.

E. System Controls and Monitoring

1. Comply with Section 23 09 23, DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install the ground-source heat pump system in accordance with this section and the printed instructions of the manufacturer.

B. Prior to any excavation, trenching, or drilling, all existing buried utilities, drainage, and irrigation systems shall be located and flagged by the appropriate utility and Contractor representative.

C. Vertical Closed Loop Source Well

1. Borehole Construction
   a. Loop installation shall be in accordance with IGSHPA Configuration C, and modeling to determine loop lengths shall be in accordance with IGSHPA Configuration B.
   b. Surface water shall not be used as a source of water during the drilling of a Vertical Closed Loop borehole unless it is obtained from a municipal water supply system. Water used for drilling purposes shall be potable water that contains a free chlorine residual of

no less than 10 milligrams per liter. Chlorine residual level shall be checked with chlorine test strips.

c. Boreholes shall have a minimum diameter such that it is large enough to accommodate the specified u-bend assembly and tremie pipe (grout pipe). The tremie pipe shall have a minimum nominal diameter of 25.4 mm [1.00 inch]. (Nominal 6" bore hole.)

d. When penetrating more than one aquifer, all vertical boreholes shall be grouted bottom to top within 24 hours with a material that is certified by the National Sanitation Foundation International to ANSI/NSF 60 and has a known heat transfer capacity and an adequate sealing characteristic. The grouting material shall be classified as either a pliable (such as bentonite-based) or rigid (such as cement based) material.

2. Grouting - The following provisions are recommended for grouting (sealing) of the void space between the piping and borehole of a Vertical Closed Loop:

a. Grouting is to be completed in a manner that prevents the introduction of surface or near surface contaminants into an aquifer, the interchange of water from different aquifers, or the loss of natural artesian pressure from an aquifer.

b. The void space between the piping and the borehole shall be grouted in a continuous operation from bottom to top using grout placement procedures set forth in the IGSHPA Grouting for Vertical Heat Pump Systems, Engineering Design and Field Manual, 2000.

c. A tremie pipe (grout pipe) not less than 25.4 mm [1.00 inch] nominal diameter shall be placed to the bottom of the borehole before grouting. The tremie pipe may be used to push the closed-loop piping into the borehole and shall be retracted as grouting proceeds. The tremie pipe shall be removed from the borehole upon completion of grouting.

d. Grout shall be pumped through the tremie pipe until the density of the grout flowing from the borehole at the ground surface equals the density of the grout being pumped in. Each borehole shall be grouted upon completion. The contractor shall monitor each borehole for settling for a period of not less than 12 hours. Additional grout shall be added and the monitoring period shall be extended until the settling of grout stops.

e. A borehole drilled using horizontal directional drilling techniques shall be grouted by pumping grout as the tremie pipe is retracted through the borehole.

f. Grout manufacturer's product specifications shall be followed when mixing and pumping grout.

g. To minimize potential leaching of chemical constituents into an aquifer, grouts, drilling fluids, and additives to grouts and drilling fluids, including sand added to grout as thermal-enhancer for Vertical Closed Loop applications, shall meet ANSI 60.

h. The maximum allowable permeability value of the set grout shall be 1×10^{-7} cm per second, as determined in accordance with ASTM D-5084.

D. Tracer wire shall be installed along entire length of header piping.

E. Piping installation shall be compliant with ICC IMC Section 1206.

F. Pipe Joining Methods:

1. The only acceptable methods for joining buried polyethylene pipe systems is a heat fusion process.

2. Polyethylene pipe shall be heat fused by butt, socket, sidewall in accordance with the piping manufacturer's procedures.

a. Heat-Fusion Joints: Joint surfaces shall be clean and free of moisture. Joint surfaces shall be heated to melt temperatures and joined. The joint shall be undisturbed until cool. Fittings shall be manufactured in accordance with ASTM D-2683.

3. Polyethylene fusion transition fittings with threads shall be used to adapt to copper. Polyethylene fusion transition fittings with threads or barbs shall be used to adapt to high strength hose. Barbed fittings utilizing mechanical clamps are not permitted to be connected directly to polyethylene pipe, with the exception of stab-type fittings as described above. All mechanical connections shall be accessible.

3.2 FIELD QUALITY CONTROL

A. Field Inspection: Prior to initial operation, inspect the piping system for conformance to drawings, specifications and ASME B31.1. Inspect the following information on each unit:

1. Manufacturer's name or trademark.
2. Model name or number.
3. Certifying agency label and rating.

B. Tests: Provide equipment and apparatus required for performing tests. Correct defects disclosed by the tests and repeat tests. Conduct testing in the presence of the CM.

1. Polyethylene piping, tubing, fusion joints and loops shall be pretested before installation per IGSHPA 2014 Section 1E.
2. Piping Test: Pneumatically test new piping for leakage using air at a pressure of 200% of design pressure. Test new water piping for leakage using water at a pressure of at least 690 kPa (gage) [100 psig] per ICC IMC Section 1208 but no less than 150% of design operating pressure. Install a calibrated test pressure gage in the system to indicate loss in pressure occurring during the test. Apply and maintain the test pressure for one hour, during which time there shall be no evidence of leakage, as detected by a reduction in test pressure. Should a reduction occur, locate leaks, repair, and repeat the test.
3. Operation Tests: Perform tests on mechanical systems, including pumps, controls, controlled valves, and other components in accordance with manufacturer's written recommendations.
4. Test entire system in accordance with Section 23 05 93, TESTING, ADJUSTING AND BALANCING FOR HVAC.

3.3 FOLLOW-UP VERIFICATION

A. Upon completion of acceptance checks, settings, and tests, the Contractor shall:

1. Protect the system against biological growth and freezing in accordance with Section 23 25 00, HVAC WATER TREATMENT.

2. Show by demonstration in service that the ground-source heat exchange system and associated heat pump system are in good operating condition and properly performing the intended function.

B. Testing the thermal-transfer capacity of the well field shall be completed prior to demobilizing the well drilling equipment.

C. Shall pressure test the well field piping to verify no leaks in the system and shall occur prior to backfill or burring and element of the well field. No element of the well field horizontal distribution shall be buried until after successful acceptance testing via pressure test.

3.4 INSTRUCTION

A. A complete set of operating instructions for the ground-source heat pump system shall be laminated or mounted under acrylic glass and installed in a frame near the equipment.

B. Furnish the services of a factory-trained technician for one, 8-hour training period for instructing personnel in the maintenance and operation of the ground-source heat pump system, on the dates requested by the Owner.

3.5 COMMISSIONING

A. Provide commissioning documentation in accordance with the requirements of Section on GENERAL COMMISSIONING REQUIREMENTS and Section 23, COMMISSIONING OF HVAC SYSTEMS for all inspection, start up, and Contractor testing required above and required by the System Readiness Checklist provided by the Commissioning Agent.

B. Components provided under this section of the specification will be tested as part of a larger system. Refer to Section 23 08 00, COMMISSIONING OF HVAC SYSTEMS and related sections for Contractor responsibilities for system commissioning.

END OF SECTION 23 64 13

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SECTION 23 64 23 - WATER SOURCE MODULAR SIMULTANEOUS HEATING AND COOLING SYSTEM

PART 1 - GENERAL

1.1 WORK INCLUDED

A. Basis of Design Work Included The water-source modular simultaneous heating and cooling chiller system shall consist of individual modules that are assembled on site. Each module shall be completely factory wired and tested prior to shipment. Each module shall include a compressor, brazed plate evaporator, brazed plate condenser, geothermal fluid brazed plate heat exchanger, and controls. The controls shall also be designed to operate on a distributed master control system which allows each individual slave microprocessor to operate on its own temperature sensors if there is a failure of the master microprocessor.

B. Optional Design Work Included The water-source modular simultaneous heating and cooling chiller system shall consist of individual modules that are assembled on site. Each module shall be completely factory wired and tested prior to shipment. Each module shall include a compressor, brazed plate evaporator, brazed plate condenser, and controls. The controls shall also be designed to operate on a distributed master control system which allows each individual slave microprocessor to operate on its own temperature sensors if there is a failure of the master microprocessor.

C. Related Work Specified Elsewhere General Requirements of Division One and Section 15010 “Basic Mechanical Requirements” pertain to and are hereby made part of the work of this Section of the specifications.

1.2 QUALITY ASSURANCE

A. Modules shall be constructed in accordance with the UL 60335-2-40 and NEC standards and be UL or ETL listed.

B. Modules shall meet the safety standards of ANSI/ASHRAE 15 – Safety Standard for Refrigerated Systems.

1.3 SUBMITTALS

A. Submit complete drawings including cabinet dimensional details and anchor point locations, required clearances, location and sizes of field connections, performance data, electrical wiring diagrams, dry and operation weights, and all required electrical data.

B. Submit manufacturer’s installation instructions, including any remote panel installation instructions.

C. Operating and Maintenance manuals: provide two copies of current commercial manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturer's installation instructions for rigging, unloading, and transporting modules.

B. Protect modules on site from physical damage after unloading.

1.5 WARRANTY

A. Entire unit: one-year parts. Compressor: five years parts.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Trane (Basis of design)
2. ChillMaster (Optional design)
3. WaterFurnace (Optional design)

2.2 MODULAR SIMULTANEOUS HEATING and COOLING SYSTEM

A. General

Each module shall be assembled on an integral white painted formed sheet metal steel frame. The module shall be shipped individually and assembled on site. Each module shall be fully charged with refrigerant and factory tested for capacity and controller functions prior to shipment. The module system must be built for single point power supply connection to a central distribution block inside an electrical power distribution panel and shall incorporate circuit breaker overload protection for each module. Electrical supply to each module shall consist of flexible conduit from the power distribution panel. No electrical connection to a module shall carry the load of more than that module. The electrical supply conduit shall be factory assembled and shipped with each module for field connection into the power distribution panel

The basis of design modular simultaneous heating and cooling system is designed to have individual modules to operate in a heating mode, cooling mode or simultaneous heating and cooling based on the system demand. The modular system contains independent fluids loops that are never mixed for hot and cold load fluids and the source/sink fluid. The cold load fluid has a dedicated evaporator, the hot load fluid has a dedicated condenser and the source/sink fluid has a dedicated heat exchanger that operates as an evaporator or condenser depending on the operating mode. The single refrigeration circuit includes check valves and solenoid valves and actuated ball valves that directs flow to relevant evaporator, condenser and/or source/sink heat exchanger.

The optional design modular simultaneous heating and cooling system is designed to have individual modules to operate in a heating mode, cooling mode or simultaneous heating and cooling based on the system demand. The modular system contains mixed fluids loops that are for hot and cold load fluids and the source/sink fluid. The cold load fluid has a dedicated evaporator and the hot load fluid has a dedicated condenser. The single refrigeration circuit includes check valves and solenoid valves and actuated ball valves that directs flow to relevant

evaporator, condenser and/or source/sink. This Optional design requires additional heat exchangers on the hot and cold load fluids to isolate glycol from the building system.

Refer to the construction drawings for the additional heat exchangers and associated equipment for the optional heat pump.

B. Frame

Frame shall be constructed of formed sheet metal externally coated with white painted finish and internally coated in black.

C. Cabinet

Cabinet panels are made of sheet metal externally coated with white painted finish and internally coated in black. The cabinet enclosure shall include easily removable access panels for service. Access panels shall be removable via stainless steel fasteners and retaining clips. Module shall not require access via sheet metal screws or protruding threaded fasteners.

D. Compressors

Hermetically sealed scroll tandem compressor set on a single refrigeration circuit, oil level sight glass, suction gas-cooled motor with solid-state sensors in the windings for overload protection, and in-line circuit breaker protection. There shall be two compressors per tandem set and one refrigerant circuit per module. Compressors shall be mounted to the steel frame with rubber-in-shear vibration isolators.

E. Evaporators, Condensers and Source/Sink Heat Exchanger (Basis of Design)

Each single circuit, brazed plate evaporator, condenser and source/sink heat exchanger is constructed of 316 stainless steel plates and copper brazing and shall be insulated with ¾” closed cell insulation. The fluid piping to each module shall have an electronic two-way valve for selecting geothermal fluid or load hot or cold fluid depending on the building heating or cooling demands. The supply and return fluid piping from each evaporator, condenser, and source/sink heat exchanger shall include a manual and an electronic valve for servicing each module individually while the remaining modules continue to operate, to allow for variable flow and, on each source/sink heat exchanger operating as a condenser, to control refrigeration head pressure. The fluid connections to each heat exchanger shall use roll grooved couplings for service convenience and ease of installation.

F. Evaporators, Condensers and Source/Sink (Optional Design)

Each single circuit, brazed plate evaporator, condenser and source/sink is constructed of 316 stainless steel plates and copper brazing and shall be insulated with ¾” closed cell insulation. The fluid piping to each module shall have an electronic two-way valve for selecting geothermal fluid or load hot or cold fluid depending on the building heating or cooling demands. The supply and return fluid piping from each evaporator, condenser, and source/sink heat exchanger shall include a manual and an electronic valve for servicing each module individually while the remaining modules continue to operate, to allow for variable flow and, on each source/sink operating as a condenser, to control refrigeration head pressure. The fluid connections to each module shall use roll grooved couplings for service convenience and ease of installation.

G. Flow Switches

A thermal dispersion flow switch is provided on the discharge of each evaporator and source/sink heat exchanger for individual module flow verification on the cold fluid loop during cooling only

mode and source/sink fluid loop during heating only mode when the heat exchanger is operating as an evaporator.

H. Strainers

A compact suction diffuser with stainless steel 40 mesh strainer shall be factory installed on the branch line to each evaporator, condenser, and source/sink heat exchanger inlet.

I. Isolation valves

The strainer and flow switch can be serviced by manually closing the isolation valves on each evaporator, condenser, and source/sink heat exchanger branch line. The strainers and flow switches can be removed/replaced and the strainers cleaned without shutting down the fluid flow to the entire system to allow the remaining modules to continue to operate.

J. Refrigerant piping

Piping shall be Type K seamless copper. The suction line shall have closed cell pipe insulation, solenoid valves, check valves, and actuated ball valves in the suction, discharge, and liquid lines.

K. Fluid piping

The fluid piping shall be 6” Schedule 10 steel and shall have closed cell pipe insulation to prevent condensation and retain heat and cold. The header pipe in each heat recovery module shall connect to the adjacent module using roll grooved steel couplings and neoprene gaskets.

L. Controls

The master module shall incorporate the master microprocessor controller. The master microprocessor shall communicate with the remaining slave microprocessors in each module via a local network communications protocol. The master module shall include a phase monitor to protect against low voltage, phase unbalance, phase loss, and phase reversal conditions. The master controller shall read all analog, binary values and faults from all slave module controllers and shall pass these values to the Building Automation System via BACnet protocols

Each chiller control system shall include operational digital switches for each compressor; high and low pressure transmitters to provide indication of refrigeration pressures in each circuit; high and low refrigeration pressure alarms that shut down the responsible compressor(s); anti-short cycling compressor timers; minimum compressor run timers; and connection to Building Automation System.

M. Programmable Logic Controller (PLC)

The PLC shall provide the following minimum functions and alarms:

1. Adjustable fluid temperature set point
2. Multiple stage compressor control, including compressor rotation to provide even compressor usage and wear.
3. Reset temperature control set point based on decreased load
4. High and low fluid temperature alarm set points
5. Fluid inlet and outlet temperature
6. Suction and discharge refrigeration pressures on each refrigeration circuit
7. Compressor run status
8. Current alarm status
9. Demand load

10. Compressor run hours
11. Number of compressors starts
12. Alarm logging with minimum of previously 100 logged alarms with time and date of each occurrence
13. Remote start/stop input
14. Dry contact for general alarm
15. 'Smart' compressor demand distribution algorithm across chiller bank, which seamlessly allows unavailable modules to be placed out of sequence and available modules to be placed back in sequence
16. Provide BMS with the information for automatic variable flow control
17. Maintaining minimum flow for chilled water and hot water loops even with no compressors running
18. 'Smart' compressor rotation algorithm within a module which accounts for compressor availability and safety timers
19. Stand-alone fail-safe mode for each module should Master module fail, allowing the chiller system to remain operating

N. Interface Panel

A smart operator touch screen interface panel with graphical display shall be installed on the master module to allow operation and alarm monitoring, adjustment of user set points, and controlled temperatures trending

O. Remote Connection

Remote monitoring of chiller operation shall be fully integrated into the siemens BMS, of all available points, alarms, and sequence of operations.

END OF SECTION 23 64 23

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SECTION 23 73 13 – CUSTOM INDOOR CENTRAL STATION AIR HANDLING UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Indoor Air Handling Units.

1.2 REFERENCES

A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.

B. AMCA 99 - Standards Handbook.

C. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.

D. AMCA 300 - Test Code for Sound Rating Air Moving Devices.

E. AMCA 500 - Test Methods for Louver, Dampers, and Shutters.

F. AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils.

G. AHRI 430 - Central-Station Air-Handling Units.

H. AHRI 435 - Application of Central-Station Air-Handling Units.

I. ASTMB117 - Standard Practice for Operating Salt Spray Apparatus.

J. NEMA MG1 - Motors and Generators.

K. NFPA 70 - National Electrical Code.

L. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

M. UL 723 - Test for Surface Burning Characteristics of Building Materials.

N. UL 900 - Test Performance of Air Filter Units.

O. UL 1995 - Standard for Heating and Cooling Equipment.

P. UL 94 - Test for Flammability of Plastic Materials for Parts in Devices and Appliances.

Q. IBC 2000, 2003 - International Building Code.

R. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

S. NFPA 5000 - Building Construction and Safety Code.

T. ASHRAE 90.1 Energy Code.

U. AHRI Standard 1060 - Rating Air-to-Air Heat Exchangers for Energy Recovery Ventilation Equipment.

V. GSA 2003 Facilities Standard - 5.9 HVAC Systems and Components.

1.3 SUBMITTALS

A. Shop Drawings: Indicate assembly, unit dimensions, weight loading, required clearances, construction details, field connection details, and electrical characteristics and connection requirements. Computer generated fan curves for each air handling unit shall be submitted with specific design operating point noted. A computer generated psychometric chart shall be submitted for each cooling coil with design points and final operating point clearly noted. Sound data for discharge, radiated and return positions shall be submitted by octave band for each unit. Calculations for required baserail heights to satisfy condensate trapping requirements of cooling coil shall be included.

B. Product Data:

1. Provide literature that indicates dimensions, weights, capacities, ratings, fan performance, finishes of materials, electrical characteristics, and connection requirements.

2. Provide data of filter media, filter performance data, filter assembly, and filter frames.

3. Provide manufacturer's installation instructions.

1.4 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing Air Handler products specified in this section must show a minimum five years documented experience and complete catalog data on total product.

1.5 SAFETY AGENCY LISTED & CERTIFICATION

A. Air Handling units shall be cETLus safety listed to conform with UL Standard 1995 and CAN/CSA Standard C22.2 No. 236. Units shall be accepted for use in New York City by the Department of Building, MEA 342-99-E.

B. Air handler furnished with double width, double inlet (DWDI) fans and/or plenum fans where applicable, shall be certified in accordance with the central station air handling units certification program, which is based on AHRI Standard 430. (NOTE: Above does not apply to fan array)

C. Air handling unit water heating & cooling coils shall be certified in accordance with the forced circulation air cooling and air heating coils certification program, which is based on AHRI Standard 410.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site.

B. Accept products on site on factory-furnished shipping skids. Inspect for damage.

C. Store in clean dry place and protect from construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

PART 2 - PRODUCTS

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, all air-handling units shall be manufactured by **Ventrol**. Other manufacturers offering similar products may be incorporated, they include, the following:

1. Ventrol, basis of design
2. Temtrol
3. Governair

2.2 MANUFACTURED UNITS

A. General Description: Factory assembled, consisting of fans, motor and drive assembly, coils, dampers, plenums, filters, drip pans, mixing dampers and other accessories as indicated on drawings or schedules.

B. Motor and Electrical Components: Refer to Division 15 Section "Electrical Requirements for Mechanical Equipment."

C. All air handler controls shall be via the Siemens BMS with the exception to the fan wall and heating wheel. The factory controls for the fan wall and heat wheel shall be integrated into the BMS. Refer to drawing H-502 for air handler sequence of operations and points list.

2.3 AIR HANDLING UNITS

A. General: This specification covers the performance requirements and the material/construction requirements of custom-built air handling units. The detailed performance and data sheets and/or equipment schedule drawing(s) are considered part of this specification.

B. Warranty: The manufacturer shall provide the parts warranty for equipment manufactured and all vendor supplied components. The said warranty shall cover replacement of all defective parts for a period of 12 months from equipment start up, not to exceed 18 months from date of shipment.

C. Submittal: The successful manufacturer shall provide Shop drawings and submittal data for review. The submittals and shop drawings shall be complete in all respects including the following information:

1. Overall unit dimensions and individual components and section dimensions.

2. Sound analysis consisting of inlet, outlet and radiated sound power levels per unit performed by an AMCA 300 accredited lab.

3. Shipping and operating weight of unit and/or sections.

4. Materials of construction.

5. Cross section details of typical wall, floor and roof construction.

6. Component equipment data as detailed in component specification section.

7. Unit performance data including sound data.

8. Details of coil support in a coil bank.

9. Piping connection sizes and approximate locations.

10. Door and window sizes and elevations.

11. Drain pan details.

12. Operating and Maintenance Data

D. Product Delivery, Storage and Handling
All equipment shall be delivered to the job site suitably packaged and protected for overland trucking using heavy-duty protective shrink-wrap plastic. Where multiple units are required, a schedule of priority will be furnished which shall determine the manufacturing and delivery sequence. In general, units shall be delivered in one piece unless indicated otherwise. Where building constraints, unit size or trucking limitations require that units ship in more than one piece, the manufacturer shall indicate all split points on the shop drawings. All items shipped loose such as filters, steam humidifier assemblies, caulking, etc. shall be itemized on the packing slip and be suitably secured in the unit or on a separate pallet.

E. General Design Considerations
Coils shall be arranged so that space between coils is a minimum of 24”, unless specifically shown otherwise on drawings. Fan compartment shall be arranged such that the space between the fan inlet(s) and the housing is a minimum of 75% of fan diameter, unless noted or shown otherwise on the schedule or drawings. Coil assembly shall have provisions to facilitate total or partial removal from coil bank. Housing shall be designed and sealed to minimize air and water vapor leakage. Housing shall be designed and tested to meet maximum leakage of SMACNA class 3 when tested in accordance with the procedure outlined in the SMACNA HVAC Air Duct Leakage Manual.

F. Factory Testing
The units noted below shall be tested by the unit manufacture prior to shipping. Factory testing shall be done on the assembled unit. An owner's representative shall witness the test. Manufacturer to provide two weeks’ notice.

1. CASING LEAKAGE TEST:
Housing shall be designed and tested to meet maximum leakage of SMACNA class 3, tested in accordance with the procedure outlined in the SMACNA HVAC Air Duct Leakage Manual. Leakage test will be conducted at 1.5 times the supply fan and/or return fan operating static pressure to a maximum of 12in.w.g. for 4-inch walls and 10in.w.c. for 2-inch walls, positive or negative depending on the unit configuration, and

shall not leak more than 1% of the unit volumetric flow rate (cfm).

Leak testing is performed by measuring the airflow pumped in or out of the airside portion of the unit at various static pressures. An orifice tube with a variable supply system, as described in SMACNA Leakage Test Manual, is used as the airflow measurement system.

POSITIVE PRESSURE Supply fan discharge opening and all supply air openings are sealed. The airflow measurement system is ducted to the unit and flow measured at specified static pressure.

NEGATIVE PRESSURE Supply fan discharge opening and all return air and other openings are sealed. The airflow measurement system is ducted to the unit and flow measured at specified static pressure.

The pressure drop across the orifice tube in the airflow measurement system is measured with a manometer. The airflow is then calculated using the SMACNA Leakage Test Manual equation 5-1. Leakage at the specified static pressure is then calculated from the data taken.

2. AIRFLOW AND STATIC CAPABILITY TEST:
The unit is started-up and operated at full capacity. Fan system effects, which cannot be measured during the test but have been estimated, will be added to the actual static pressure measured when applicable. The total shall equal the total design static pressure. Static pressure is set by adjusting inlet and / or outlet dampers until the design pressure is achieved. Alternately, pre-filters or coils can be partially blocked.

Supply airflow is measured with a set of Pitot Tubes and a Fluke - Airflow Meter. The set of Pitot Tubes covers an approximate 1 square foot area. There are a total of 4 Pitot Tubes. The velocity pressure applied via the 4 Pitot Tubes is mechanically averaged and presented to the meter as one single pressure. Flow rate is determined multiplying the average velocity by the area of an appropriate plane of the air handler. The measuring plane can be a surface inside the air handler, such as a bank of filters or coils.

Current readings for each phase will be taken at the inlet to the control panel or starter panel when applicable.

3. PANEL DEFLECTION TEST:
The panel deflection is measured on the cabinet exterior wall, typically in conjunction with an airflow or leakage test. Prior to pressurization of the unit, a measuring dial is placed on the seam between two panels and a first reading is taken. The unit is then pressurized to the specified static pressure. A second reading is taken on the dial and the deflection is calculated as the difference between the two measurements.

Cabinet deflection shall not exceed 1/180 of the panel length on 2” wall units and 1/240 on 4” wall units. A written test report shall be prepared by the manufacturer and issued to the Owner’s representative.

4. AHU FACTORY FAN VIBRATION TEST:
Vibration tests are performed after the fan and motor have been assembled on their isolators.

A.) FANWALL®

Accelerometers are placed on the inboard and outboard motor bearings in 3 planes: X, Y, Z. While running at capacity, vibration measurements are taken in all 3 planes with an UltraSpec Dynamic Balance Analyzer Model 8117 or the Emerson 2140.

Measurements are taken in velocity (inch per second PEAK). Vibration velocity is reported below the specified tolerance. ANSI/AMCA 204 is also used in reference.

The report shall show the final results of balancing with the analyzer's filter tuned to the speed of the fan.

B.) All other fans

Accelerometers are placed on the 2 fan bearings in 3 planes: X, Y, Z. The fan is run and vibration measurements are taken in all 3 planes.

Measurements are taken in mils pk-pk (displacement). By adding small weights on the fan blades, the fan is balanced. Vibration displacement is reported below the specified. ANSI/AMCA 204 is also used in reference.

5. AHU FACTORY SOUND PRESSURE TEST

Site description:

Sound tests shall be conducted while the unit is running at design conditions. Sitting in the middle of an unobstructed bay (55 feet wide) in a large factory space (400 x 300 feet approximately) with a ceiling height of 28 feet. Floor is concrete, ceiling is steel deck over metal trusses, and walls are concrete blocks.

Measurements conditions:

Tests shall be conducted while all work is stopped and all unnecessary noises eliminated, resulting in a background noise level lower than 50 dBA and unit noise measurements being at least 10 dB above.

Description of measurements:

Sound pressure level (Lp) (in dB, ref. 20 μPa) readings in all nine octave bands (31.5 to 8000 Hz) at feet from designated openings and 5 feet adjacent to fan sections outside of the unit casing.

Calibration check of sound Level meter will be done before and after measurement test. Microphone shall be at 5 feet from floor or horizontal surface and away from direct air turbulence.

All measurements will be monitored to exclude any undesirable noises that are not from the unit. (Ex. Airplane, siren noise, etc.)

Report:

Report shall show the measurements and a sketch showing the general arrangement of the test set up. (Points of measurement, distances etc.)

Measurement parameters: (Produced by sound level meter application software) showing

time, date and sound level meter setting.

6. AHU SOUND ANALYSIS

Sound analysis consisting of inlet, outlet and radiated sound power levels performed by an AMCA 300 dual reverberant chamber accredited lab. **Sound analysis from a non-AMCA accredited lab will not be accepted.**

2.4 UNIT CONSTRUCTION

A. Unit Base / Floor / Frame Work:
The unit base frame is manufactured with an electrostatic pre-primed powder coated 2" X 6" X 0.125" HSS type rectangular structural tubing. The unit base frame is epoxy primed. Unit base is fitted with 20" on-center C-channel cross support members. The completed unit base coating must be able to sustain salt spray testing of 1000 hours, per ASTM 117B. **Sheet metal formed unit bases are not acceptable.** The "Double Bottom" base features a 4.5" thick insulated walk-on floor as specified below. The base rails are fitted with Bolted removable lifting lugs at the unit or module (if demounted) corners. **Sheet metal lifting lugs are not acceptable.** Floor liner shall be 16-ga, G-90 galvanized steel. Floor seams shall be sealed to create leak free joints. The under floor liner shall be G-90 galvanized steel and recessed nominal ½" to allow for air circulation under the unit floor. All floor openings on outdoor units are complete with floor grating. The entire unit base must be polyurethane foamed in place with a minimum thickness of 3" and a minimum R value of 20. **Fiberglass insulated unit bases will not be acceptable.** Maximum deflection of floor shall be L/360 at design loading (L=span in inches), the minimum floor design load is 150 lbs/sqft (distributed load), and the maximum point load on floor shall be 300 lbs (over 1 square foot).

A. Panel structural strength:

a. L/180 at +/- 8" w.c. for 2" construction (L= span in inches). Deflection is worst case at the center of wall span.

i. Minimum roof and wall load is 75 lbs /sqft (distributed load such as wind and snow)

ii. Maximum point load on roof shall be 300 lbs (over 1 square foot)

The polyurethane injected foam, 2.5 pcf with an effective thermal conductivity (C) of 0.125 BTU in/hr sq.ft°F). The foam insulation has an ozone depletion potential of 0, a global warming potential of 0 and is VOC exempt. It is also rated UL94 HF-1.

B. Cabinet – Smooth Exterior Panels:
Formed and reinforced wall panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed. Outside Casing shall be solid 16-ga, Bright spangled G-90 galvanized steel, double die-formed 2" thick panel secured with 1/4" hex head, zinc plated fasteners at 12" on-centers.
The inside liner shall be 20-ga, G-90 galvanized steel. Liner shall be secured with sheet metal screws to outside casing at 12" on-centers.

The unit construction needs to be thermal break PVC (poly-vinyl chloride) closed cell foam gasket meeting NFPA 90 A and B. The panel construction must meet a minimum R value of 8.3

in the walls and ceiling. **The injected foam insulation has a mean R value of 20. For 4" THICK optional unit, foam insulation has a mean R value of 26.4.**

2.5 ACCESS DOORS AND PANELS:

A. Access doors are constructed with a double wall construction and an extruded aluminum frame. The door frame features a built-in no-through-metal high density resin barrier and a perimeter gasket. **Door frames with no thermal break are not acceptable.** The door gasket is seamed together at each corner to prevent leakage through the door. Door is attached to the unit with **3 axes adjustable stainless steel hinges**. Doors shall open against higher pressure side. Where this is not feasible due to site constraints, an interlocking mechanism furnished on the fan section access door with a de-energizing switch complying with CAL-OSHA, ETL and the mechanical protection requirements of UL 1995 will be provided.

B. Inspection access panels and doors shall be sized and located to allow periodic maintenance and inspections. Provide access panels and doors in the following locations as shown on drawings

C. Dual-paned tempered glass with vacuum seal windows, molecular sieve sealant and thermally broken frames shall be supplied as shown on unit drawings. Singled paned windows are not acceptable.

D. All outward swinging doors must be equipped with a door chain to limit door swing.

2.6 FANWALL TECHNOLOGY®

A. Manufacturers

a. NAS, Nortek Air Solutions, including Governair, Huntair, Mammoth, Temtrol, Venmar, and Ventrol.

b. Approved Equal

i. Must be submitted per project specifications

ii. Must guarantee submitted AHU performance for flow, pressure, and acoustics at the perimeter boundary of the unit.

iii. Any corrective acoustical treatment, added airway tunnel lengths, increased electrical service, and any structural modifications necessary to meet specified and scheduled performance shall be provided at no additional cost to the owner to meet the specified performance criteria.

B. Fan Wheel HPF-A100

a. Fans shall be aluminum airfoil wheel, Class III, direct drive arrangement and shall be individually housed. Fans shall be certified by AMCA for performance. Fan shall be housed in a "cell".

b. Fan housing or "cell" shall be constructed of aluminum or stainless steel with perforated inner liner, melamine insulation, with either solid or perforated outer panels as required by application.

c. Fan/motor assembly shall be mounted within the housing on an adjustable slide rail base. Fan/motor assembly must be capable of either horizontal or vertical application.

d. Each fan/motor assembly shall be dynamically balanced to meet AMCA standard 204-96, for fan application class BV-5, to meet or exceed a rotational imbalance Grade G.55, producing a maximum rotational imbalance of 0.022 inches per second peak, filter in. “Filter in” measurement indicates that the specified balance grade must be achieved at the submitted design operating speed for the fan(s).

e. Fan and motor assemblies shall be designed for application in multiple fan arrays.

C. Motors

a. AC Motors:

i. All motors shall be standard foot mounted type, TEFC or TEAO motors selected at the specified operating voltage, RPM, and efficiency as specified or as scheduled elsewhere.

ii. Motors shall meet the requirements of NEMA MG-1 Part 30 and 31, section 4.4.2.

iii. Motors shall be as manufactured by Baldor, Siemens, or Toshiba. Motors shall be available in 1/2 HP increments at nameplate HP ratings from 1.5 HP through 12 HP.

iv. All motors shall include permanently sealed bearings and shaft grounding means to protect the motor bearings from electrical discharge machining due to stray shaft current. Motors provided with hybrid ceramic bearings, when specified, do not require shaft grounding devices.

v. Steel cased motors and/or ODP motors are not acceptable.

b. Electronically Commutated Permanent magnet motors (ECMi)

i. All ECMi motors shall be UL listed with brushless permanent magnet motors.

ii. All bearings shall be permanently lubricated

iii. Motors shall have a design life of L10 100,000 hours

iv. Motors shall have a means of shaft isolation to prevent electrical arcing across bearings

v. Motors shall be complete with electronic motor overload protection, locked rotor protection and thermal management

vi. Motors shall meet IP54 protection and thermal class THCL 155.

vii. Modbus communication option available

c. Ultra-Premium Efficient Motors (IE5+)

i. Provide FANWALL Ultra-Premium Efficient Motors IE5+ that meet IE5 efficiency levels. Compared to NEMA Premium induction motors, these FANWALL Ultra-Premium Efficient Motors shall have tested data that shows a 5HP motor having 4.5% improved efficiency at nominal nameplate speed and load and over 20% improved efficiency at 40% turndown speed along a fan curve.

D. Acoustical Performance

a. The AHU unit shall provide the specified acoustical performance as scheduled for the unit supply discharge opening(s), RA opening(s), and the Outside air and Exhaust air opening(s).

b. Coplanar silencer(s) and/or sound attenuator(s) shall be provided to meet specified acoustical requirements. Sound attenuator cross sectional area shall be selected to not exceed 500 fpm. Losses from sound attenuating devices must be included in the fan performance selection.

c. Listed or alternate manufacturers, other than the basis of design, providing fan arrays that incorporate fans which are not manufactured by the AHU manufacturer, must provide modeled acoustical performance of the AHU unit.

d. Sound and performance data for approval showing only single fan performance for multiple fan array application will be returned without review.

e. Any proposed remedy for deviations in submitted sound power levels shall be approved by a registered acoustical consultant as selected by the owner or architect. Costs for review of proposed changes shall be borne by the contractor.

E. Multiple Fan Arrays

a. The fan array shall consist of multiple housed fans or “cells”, spaced in the air way tunnel cross section to provide a uniform air flow and velocity profile across the entire air tunnel cross section and components contained therein.

b. Each fan and motor assembly shall be removable through a 24” wide, free area, access door located on the discharge side of the fan wall array without removing the fan wheel from the motor.

c. All fans in the multiple fan arrays shall be AMCA certified for performance per AMCA arrangement “A” testing configuration. The submitted fan performance shall be inclusive of system effects attributed to the fan mounting arrangement, fan enclosures, back draft dampers, and other fan appurtenances not considered when AMCA certified performance per AMCA arr. “A” is determined. Submitted AHU/fan performance that does not indicate allowances for system effects for the back flow prevention device(s), wheel enclosures, safety screens, bearing pedestals, belt guards, or the fan and motor enclosure in which each fan is mounted, will be returned to the contractor disapproved and will need to be resubmitted with all of the requested information included for approval. Added system effects for acoustic attenuators, or other devices required to meet specified fan performance and sound levels must be indicated in the submitted fan selection data.

d. Fan system power requirements or sound power levels that fail to meet specified performance levels shall be corrected to meet specified performance levels at no additional cost to the owner. Any proposed corrections for power or sound deviations from specified values must be submitted to the engineer for approval prior to implementation of any proposed corrective procedure.

e. Submittals for units providing less than the scheduled quantity of fans and/or spacing of the fans for multiple fan arrays shall submit CFD modeling of the air flow profile for approval that indicates uniform velocity and flow across all internal components without increasing the length of the AHU unit or changing the aspect ratio of the unit casing as designed.

f. Manufacturers that do not manufacture their own fans for the specific purpose of use in multiple fan arrays, shall provide a letter guaranteeing submitted AHU performance for flow, pressure, and acoustics at the perimeter boundary of the unit signed by an officer of the OEM fan manufacturer being submitted. Any corrective acoustical treatment, added airway tunnel lengths, increased electrical service, and any structural modifications necessary to meet specified and scheduled performance shall be provided at no additional cost to the owner to meet the specified performance criteria. All proposed corrective actions, when required, must be submitted for approval and shall include a guarantee of performance, as listed above, at no additional cost to the owner.

F. Backdraft dampers:

a. Each fan applied in multiple fan applications shall be provided with an integral back flow prevention device that prohibits recirculation of air in the event a fan, or multiple fans, becomes disabled. The system effect for the submitted back flow prevention device shall be included in the calculation to determine the fan TSP for fan selection purposes, and shall be indicated as a separate line item SP loss in the submitted fan selection data. Manufacturers other than the basis of design being submitted must provide independent lab certification of fan testing that indicates the system effects attributed to the submitted back flow prevention device in the submitted close coupled mounting arrangement at the inlet of the fan. Fans submitted with discharge dampers will not be approved.

b. Back Draft Damper performance data that is based on an AMCA ducted inlet and ducted discharge mounting configuration will not be accepted. Submitted Back flow prevention device data must be reflective of close coupled mounting at the intake of the fan(s) per the project design documents. Motorized dampers or other motorized devices submitted for back flow prevention are not acceptable.

c. AHU Manufacturers that do not manufacture the fans being submitted must provide tested and certified performance data for fans as installed in the AHU unit including the back draft damper system effects introduced by close coupled back draft dampers at the fan inlet.

G. Fan Airflow Monitoring

a. Fans shall have noninvasive; zero pressure drop flow a/o pressure sensing taps installed in the fan inlet cone for airflow monitoring capability as specified.

b. Airflow Totalization: Each fan assembly shall be supplied with a complete flow measuring system, which indicates airflow in Cubic Feet per Minute. The flow measuring system shall consist of a flow measuring station with one static pressure tap and one total pressure tube located at the throat of the fan inlet cone of all fans on the FANWALL. The flow measuring station shall not obstruct the inlet of the fan and shall have no effect on fan performance (flow or static) or sound power levels. A surface mounted LCD HMI, located on the unit exterior adjacent to the variable frequency drive, shall provide a digital CFM readout, and a PLC will provide a 4-20 ma output control signal that is proportional to the airflow rate in CFM for interface with the Building Management System (BAS) via Modbus, BACnet IP or BACNet MSTP communication protocol.

H. Control Panel

a. Each fan motor shall be individually wired to a motor control panel containing motor overloads and VFD(s). VFD configuration may be one of the following (please select)

i. Each motor having its own VFD (Required for FANWALL® System Optimization Controls)

b. Each control panel shall have a single point electrical power connections. Therefore, units with supply and return fan wall would have two power connections.

c. Wire sizing shall be determined, and installed, in accordance with applicable NEC standards and local code requirements.

I. System Optimization (Available only with Required for FANWALL® System Optimization Controls)

a. Provide internal ground fault protection such that a ground fault in any of the motor circuits does not cause a system shutdown.

b. Controls

i. The multiple fan array electrical panel shall continuously monitor required flow and pressure and include system optimization controls to actively control fan speed and to enable and disable fans in the multiple fan array to achieve substantially peak efficiency for the fan system at any given point of system operation.

ii. Multiple fan array system optimization controls shall be provided by the AHU unit manufacturer to assure single source responsibility for multiple fan array flow and pressure controls, and shall require only an input control signal from the controls contractor for SP or flow for proper operation of the system optimization controls.

iii. The AHU unit manufacturer shall provide a single communication interface with the BAS, utilizing BacNet..

iv. Means for monitoring and controlling individual fan and motor status for each of the multiple fans and motors in the array shall be provided.

v. The multiple fan array control panel(s) shall be provided with means to indicate fan and motor status, operating mode, system flow rate and fan total static pressure, as well as connected and required HP at the current system flow and pressure conditions.

vi. Status shall be displayed at the unit control panel and/or at the remote location of the building automation system control panel and interface screens.

vii. The AHU unit shall be completely factory-wired, requiring only field wiring of main power wiring to the line side of the main power disconnect switch, and a separate 120/60/1 power supply with disconnect switch for receptacles and light fixtures when indicated and required.

viii. Redundancy in the variable frequency drives shall be included, along with all necessary controls and devices to assure that in a fault condition for any drive, whether internal or external to the drive, the fan array shall maintain flow and pressure at the required fan operating speed at the time of the fault with no interruption in flow to the system affected.

2.7 COILS

A. Heating Coils:

1. Hot Water coils: AHRI Certified Performance, Continuous circuit, Self-draining unless noted on performance output.
    a. Piping connections: Same end of coil
    b. Tube Material: Round Seamless Copper
        i. 5/8” od. x 0.020” tube wall [15.8 mm x .508 mm]
    c. Fin Type: Corrugated plate with full drawn collar for accurate spacing.
    d. Fin Thickness / material / tube size:
        i. 0.008” [.203 mm] Aluminum on 5/8” tube
    e. Fin Spacing: FPI (fins per inch) / tube size
        i. 6 thru 14 FPI on 5/8” tube
    f. Fin and Tube Joint: Tubes are mechanically expanded.
    g. Coil Headers:
        i. Red Brass Male npt connections (std)
    h. Coil Casing:
        i. Galvanized steel 16ga. or 14ga.
    i. Coatings:
        i. ElectroFin® including UV protective layer
        ii. Heresite® P-413 including UV protective layer
    j. Leak testing:
        i. Entire coil assembly submerged in water and filled with Nitrogen at 315 psig.
    k. Coil Working-Pressure Rating: 250 psig at 300 deg F

B. Cooling Coils:

1. Chilled Water coils: AHRI Certified Performance, Continuous circuit, Self-draining unless noted on performance output.
    a. Piping connections: Same end of coil
    b. Tube Material: Round Seamless Copper
        i. 5/8” od. x 0.020” tube wall [15.8 mm x .508 mm]
    c. Fin Type: Corrugated plate with full drawn collar for accurate spacing.
    d. Fin Thickness / material / tube size:
        i. 0.008” [.203 mm] Aluminum on 5/8” tube
    e. Fin Spacing: FPI (fins per inch) / tube size
        i. 6 thru 14 FPI on 5/8” tube
    f. Fin and Tube Joint: Tubes are mechanically expanded.
    g. Coil Headers:
        i. Red Brass Male npt connections (std)
    h. Coil Casing:
        i. 304 Stainless steel 16ga. or 14ga.
    i. Coatings:
        i. ElectroFin® including UV protective layer
        ii. Heresite® P-413 including UV protective layer
    j. Leak testing:
        i. Entire coil assembly submerged in water and filled with Nitrogen at 315 psig.
    k. Coil Working-Pressure Rating: 250 psig at 300 deg F

2.8 FILTERS, FILTER FRAMES, AND FILTER BANKS

A. Pre-filters
The filter shall consist of a pleated media, media support grid, and enclosing frame. The media shall be non-woven cotton fabric and shall be designed to consistently increase efficiency throughout service life of filter with an initial Merv 8 rating. The media support shall be a welded wire grid with an effective open area of not less than 90%. The grid shall be bonded to the filter media to eliminate media oscillation and pull away. The enclosing frame shall be constructed of rigid, heavy duty, high wet strength beverage board. The frame shall be bonded to the filter pack. Standard sizes shall be 12" x 24" x 2" and 24" x 24" x 2". All filter holding frames must be caulked in between them to minimize bypass air through the frames. Filters shall be American Air Filter Perfect Pleat, or equal by Cam-Farr, Eco-Air or Airguard. Provide Dwyer Instruments Inc Series 2000 Magnehelic gauges across each filter bank.

B. Final Filter - Rigid Type
The filter shall be a high performance, deep pleated, totally rigid type and shall consist of a glass fiber media, media support frame, contour stabilizers, and enclosing frame. The filter media shall be a high density microfine glass fiber laminated to a non-woven synthetic backing to form a lofted filter blanket. The media shall provide superior dust holding, moisture resistance and overall performance with an initial Merv 14 rating. The media support shall be a welded wire grid with an effective open area of not less than 96%. The grid shall be bonded to the filter media to eliminate media oscillation and pull-away. The grid shall support the media both vertically and horizontally. Contour stabilizers shall be permanently installed on both the air entering and exiting sides of the filter media pack to insure the pleat configuration is maintained throughout the life of the filter. The enclosing frame shall be constructed of galvanized steel. It shall be constructed and assembled to provide a rigid and durable enclosure for the filter pack. The frame shall be bonded to the filter pack. Standard filter sizes shall be 12" x 24" x 12" and 24" x 24" x 12". All filter holding frames must be caulked in between them to minimize bypass air through the frames. Filters shall be American Air Filter Rigifil, or equal by Cam-Farr, Eco-Air or Airguard. Provide Dwyer Instruments Inc Series 2000 Magnehelic gauges across each filter bank.

C. Filter Frame Assemblies
Constructed of galvanized steel, specifically designed and sized to have matching mounting holes such that frames may be riveted together. Frame comes with pre-installed gasket so as to provide a surface onto which the filter will self-seal. Filter frames come with stiffeners which are installed between each column of filter frame. All filter holding frames are caulked in between them to minimize bypass air through the frames. Proper structural support (every 5 frames wide) is provided when reinforcement is required for attachment of frame assembly to existing AHU casing / building structure as well as complete safing and proper air seal.

2.9 DAMPERS

A. Low leakage aluminum dampers as made by TAMCO. Dampers are made of extruded aluminum airfoil blades with extruded EPDM blade gaskets and extruded TPE frame seals, 7/16'' aluminum hexagon shaft, aluminum linkage crankarm, aluminum pivot pin, acetal copolymer inner bearing and polycarbonate outer, and a 12-ga. aluminum frame.

B. Low leakage TAMCO two deck multi-zone dampers have extruded aluminum airfoil blades, extruded EPDM blades gaskets, extruded TPE frame seals, 7/16'' aluminum hexagon shaft, aluminum linkage crankarm, aluminum pivot pin, acetal copolymer (cecon) inner bearing and

polycarbonate outer bearing, and a 12-ga. aluminum frame. The cold/hot decks are on a common shaft driven by one operator. Actuator are furnished and mounted by VENTROL. Electric specified in Division 23 Section “HVAC Instrumentation and Controls.

2.10 HEAT WHEEL (INNERGY-TECH):

A. Manufacturers:

1. Innergy tech inc
2. Thermatech
3. Semco

B. General Specifications:

1. Furnish and install energy recovery wheel
2. The energy recovery wheel shall transfer both sensible and latent energies between outgoing and incoming air streams in a counter flow arrangement.
3. The energy recovery wheel shall be labeled for direction of air flow, exhaust and supply inlets and outlets.
4. The energy recovery wheel must be manufactured in North America.
5. The energy recovery wheel manufacturer must have at least ten (10) years of experience in the manufacturing of energy recovery components.

C. Product Specifications:

Media

1. The rotor media shall be made of aluminum with a minimum thickness of 2 mil.
2. All surfaces shall be coated with a non-migrating desiccant specifically developed for the water vapor transfer.
3. Etched or oxidized surfaces are not acceptable.
4. Desiccant must be a polymer hygroscopic coating.
5. Desiccant shall be bactericide and non-corrosive.
6. The rotor shall be constructed of equal width alternate layers of corrugated and flat aluminum sheet material to create a flat and smooth surface.
7. Dry particles up to 800 microns shall freely pass through the wide angle media, minimizing air pressure drop and pre-filtering requirements.
8. As specified in ASHRAE 52.2-1999, MERV 6 type filters shall be used on both faces of the wheel. Filters to be supplied by others.

Purge & Casing Assembly

9. The unit shall be provided with a factory set, but field adjustable, purge section designed to limit cross contamination when operated under appropriate design conditions.
10. The rotor shall be provided with a structural frame which limits the deflection of the rotor due to air pressure differential to less than 1/16 of an inch.
11. The framing shall be made of heavy-duty welded tubular steel construction.
12. Framing shall be painted with polyester based enamel.
13. The cover panels shall be made of galvanized steel to prevent corrosion.
14. The cassette shall be mounted with removable cover panels for service access to the motor and drive.
15. The rotor shall be supported by two pillow block bearings which can be maintained or

replaced without removal of the rotor from its casing or the media from its spoke system.

Rotor seals
16. The rotor shall be supplied with non-contact labyrinth seals facing the media and with nylon contact seals on all other surfaces.
17. The seals shall be specifically designed to compensate for pressure fluctuations.
18. The seals shall be adjustable to ensure proper sealing.

Rotor frame system
19. Rotor spoke system shall be a segmented design.
20. The rotor spoke system shall be made of strong aluminum materials providing the structural integrity required at design pressure differentials.
21. The rotor hub shall be made of extruded aluminum, without welding, for precision machining and stiffness.

Drive system
22. The rotor shall be driven by a high performance link belt made of polyurethane elastomer reinforced with polyester for easier installation and replacement.
23. An A/C inverter duty motor shall drive the rotor.
24. Wheel shall be perimeter driven.
25. Speed reduction is available by pulley change out or by controlling the motor frequency.
26. Speed reducer shall be permanently lubricated.

Controls
27. VFD controllers.
28. Factory controls with integration to the BMS.

C. Quality Assurance Specifications:
1. The energy recovery wheel shall be a UL recognized component and bear the UL mark.
2. The energy recovery wheel shall comply with the requirements of UL723.
3. The manufacturer's quality procedures shall be ISO 9001–2000 certified.
4. The manufacturer shall be a participant in the ARI Standard 1060-2005 certification program.

D. Performance Specifications:
1. The energy recovery wheel shall bear the ARI 1060-2005 Standard Certified Product Seal.
2. Sensible, latent and total effectiveness along with pressure drop, EATR and OACF ratings, shall be clearly documented in the ARI Certified Product Directory (Standard 1060-2005).
3. Performance tests shall be conducted in accordance with AHSRAE Standard 84-91.

2.11 ELECTRICAL

A. Motor starter panels with main disconnect.

B. Each motor is wired to a junction box mounted on the unit exterior.

C. Each motor is wired to a non-fused disconnect (with auxiliary switch).

D. Units are equipped with an electrical cabinet unit heater.

E. Units are equipped with vapor proof light fixture(s) with guard. Unit drawing's fixture locations are approximate. Lights shall be controlled by one switch or each light will have its own switch. Refer to unit plans for details. Conduit for lights and outlets shall be electrical metallic tube (EMT). Flexible conduit connections shall be liquid tight. All junction boxes shall be gasketed.

F. Units are equipped with vapor proof light fixture(s) with fluorescent bulbs (with guard). Unit drawing's fixture locations are approximate. Lights shall be controlled by one switch or each light will have its own switch. Refer to unit plans for details. Conduit for lights and outlets shall be electrical metallic tube (EMT). Flexible conduit connections shall be liquid tight. All junction boxes shall be gasketed.

G. 120 volt G.F.I convenience outlets provided. See drawings for quantity and locations

H. Motor Wiring
Motor shall be wired to NEMA-1 enclosure located on the exterior of unit fan housing. Conduit shall be appropriately sized EMT with a 3 ft. section of Greenfield flex conduit at the motor to provide a vibration loop. EMT conduit used up to 100 HP, TEK wire used on 100 HP and up, when single point wiring is required.

I. Starters, Electrical Devices, and Wiring: Electrical devices and connections are specified in Division 16.

J. AHU tag must bear the ETL label

2.12 VARIABLE FREQUENCY DRIVES

A. VFD shall be Z1000 type, manufactured by Yaskawa America Inc.

B. Motors should be inverter duty rated, per NEMA MG1 parts 30 and 31, for motor-drive compatibility.

2.13 DESCRIPTION

A. voltage, and horsepower indicated on the schedule. Conform to requirements of NEMA ICS 3.1.

2.14 RATINGS

A. VFD must operate, without fault or failure, when voltage varies plus 10% or minus 15% from rating, and frequency varies plus or minus 5% from rating.

B. VFD shall be 460 volts, 60 Hz, 3 Phase

C. Displacement Power Factor: 0.98 over entire range of operating speed and load.

D. Service factor: 1.0

E. Operating Ambient Temperature:
NEMA 1 (IP20): -10°C to 40°C (14°F to 104°F)

F. Ambient storage temperature: -20°C to 70°C (-4°F to 158°F)

G. Humidity: 0% to 95% non-condensing.

H. Altitude: to 3,300 feet (1000m), higher altitudes achieved by derating.

I. Vibration: 9.81m/s^2 (1 G) maximum at 10 to 20 Hz, 2.0 m/s^2 (0.2 G) at 20 Hz to 55 Hz.

J. Minimum Efficiency: 96% at half speed; 98% at full speed.

K. Starting Torque: 100% starting torque shall be available from 0.5 Hz. to 60 Hz.

L. Overload capability: 110% of rated FLA (Full Load Amps) for 60 seconds; 150% of rated FLA peak.

M. Controlled speed range of 40:1

N. The VFD's shall include EMI/RFI filters. The onboard RFI filter shall allow the entire VFD assembly to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted. No Exceptions.

O. Total Harmonic Distortion (THD) compliance: Given the information provided by the customer's electric power single line diagram and distribution transformer data, the VFD manufacturer shall carry out an analysis of the system. The analysis reviews the potential for the proposed equipment, and any existing equipment, to meet IEEE 519 (tables 10.2 and 10.3) recommendations at the Point of Common Coupling (PCC). The result of the analysis shall determine if additional power quality improvement measures should be included in the proposal to meet the THD recommendations of IEEE 519. The PCC shall be at the primary side of the main distribution transformer.

P. VFDs must be suitable for use on a circuit capable of delivering not more than 100,000 RMS symmetrical amperes.

2.15 DESIGN

A. VFD shall employ microprocessor based inverter logic, isolated from all power circuits.

B. VFD shall include surface mount technology with protective coating.

C. VFD shall employ a PWM (Pulse Width Modulated) power electronic system, consisting of:

1. Input Section:

    a. VFD input power stage shall convert three-phase AC line power into a fixed DC voltage via a solid state full wave diode rectifier, with MOV (Metal Oxide Varistor) surge protection.

    b. A minimum of 5% DC bus impedance to minimize reflected current.

2. Intermediate Section:

    a. DC bus as a supply to the VFD output Section shall maintain a fixed voltage with filtering and short circuit protection.

    b. DC bus shall be interfaced with the VFD diagnostic logic circuit, for continuous monitoring and protection of the power components.

3. Output Section

a. Insulated Gate Bipolar Transistors (IGBTs) shall convert DC bus voltage to variable frequency and voltage.

b. The VFD shall employ PWM sine coded output technology to power the motor.

D. The VFD must be rated for operation at a carrier frequency of 5 kHz to satisfy the conditions for current, voltage, and horsepower as indicated on the equipment schedule.

E. VFD shall have an adjustable carrier frequency, from 1 kHz to 12.5 kHz

F. (Above 250 HP from 1 kHz to 5 kHz)

G. VFD Must include an adjustable dynamic noise control for quiet motor operation

H. VFD shall have embedded Building Automation System (BAS) protocols for network communications; BACnet and Modbus/Memobus. These protocols shall be accessible via a RS-422/485 communication port.

I. VFD shall include two independent analog inputs. Selectable for either 0-10 VDC or 4-20 mA. Either input shall respond to a programmable bias and gain.

J. VFD shall include a minimum of seven multi-function digital input terminals, capable of being programmed to determine the function on a change of state. These terminals shall include, but not limited to:

1. Remote/Local operation selection
2. Customer Safeties
3. BAS / Damper Interlock
4. Emergency Override
5. Preset Speed
6. PI control enable / disable

K. VFD shall include two selectable 0-10 VDC or 4-20 mA analog outputs for monitoring, or "speed tracking" the VFD. The analog output signal will be proportional to output frequency, output current, output power, PI (Proportional & Integral control) feedback or DC bus voltage.

L. VFD shall provide terminals for remote input contact closure, to allow starting in the automatic mode.

M. VFD shall provide 24 Vdc, 150ma transmitter power supply

N. VFD shall include at least one external fault input, which shall be programmable for a normally open or normally closed contact. These terminals can be used for connection of firestats, freezestats, high pressure limits or similar safety devices.

O. VFD shall include three programmable form "A" contacts and one fixed “Fault” form "C" contact, capable of being programmed to determine conditions that must be met in order for them to change state. These output relay contacts shall be rated for at least 2A at 120 VAC and shall include, but not limited to:

1. Speed agree detection
2. Damper control
3. Hand / Auto Status
4. No load detection (broken belt alert)
5. Contactor Control for External Bypass
6. Drive Faulted
7. Serial communication status

P. VFD shall include a power loss ride through capable of 2 seconds.

Q. VFD shall have DC injection braking capability, to prevent fan “wind milling” at start or stop, adjustable, current limited.

R. VFD shall have a motor preheat function to prevent moisture accumulation in an idle motor.

S. VFD shall include diagnostic fault indication, time and date stamped faults storage and heatsink cooling fan operating hours.

T. VFD shall have a digital operator with program copy and storage functions to simplify set up of multiple drives. The digital operator shall be interchangeable for all drive ratings.

U. VFD shall include a front mounted, sealed keypad operator, with an English language illuminated LCD display. The operator will provide complete programming, program copying, operating, monitoring, real time clock and diagnostic capability. Keys provided shall include industry standard commands for Hand, Off, and Auto functions.

V. VFD plain language display shall provide readouts of; output frequency in hertz, PI feedback in percent, output voltage in volts, output current in amps, output power in kilowatts, D.C. bus voltage in volts, interface terminal status, heatsink temperature and fault conditions. All displays shall be viewed in an easy-to-read illuminated LCD.

W. VFD shall have an internal time clock. The internal time clock shall include a back up via battery. The time clock will be used to date and time stamp faults and record operating parameters at the time of fault. The internal time clock can be programmable to control start/stop functions, constant speeds, PID parameter sets and output Form-C relays.

X. VFD unit shall include the following meters to estimate use of energy:

1. Elapsed Time Meter
2. Kilowatt Meter
3. Kilowatt Hour Meter

Y. VFD shall include a user selectable PI control loop, to provide closed loop set point control capability, from a feedback signal, eliminating the need for closed loop output signals from a building automation system. The PI controller shall have a differential feedback capability for closed loop control of fans and pumps for pressure, flow or temperature regulation in response to dual feedback signals.

Z. VFD shall have an independent, PI loop that can be used with a second analog input that will vary the VFD analog output and maintain a set point of an independent process (valves, dampers….).

AA. The VFD shall include HVAC specific application macros. The macros can be used to help facilitate start-up. The macros will provide initialization to program all parameters and customer interfaces for a particular application (Fans, Pumps and Cooling Towers) to reduce programming time

BB. An energy saving sleep function shall be available in both open loop (follower mode) and closed loop (PI) control, providing significant energy savings while minimizing operating hours on driven equipment. When the sleep function senses a minimal deviation of a feedback signal from set point, or low demand in open loop control, the system reacts by stopping the driven equipment. Upon receiving an increase in speed command signal deviation, the drive and equipment resume normal operation.

CC. VFD shall include loss of input signal protection, with a selectable response strategy including speed default to a percent of the most recent speed.

DD. VFD shall include electronic thermal overload protection for both the drive and motor. The electronic thermal motor overload shall be approved by UL. If the electronic thermal motor overload is not approved by UL, a separate UL approved thermal overload relay shall be provided in the VFD enclosure.

EE. DD.--VFD shall include the following program functions:

1. Critical frequency rejection capability: 3 selectable, adjustable dead bands.
2. Auto restart capability: 0 to 10 attempts with adjustable delay between attempts.
3. Ability to close fault contact after the completion of all fault restart attempts.
4. Stall prevention capability.
5. "S" curve soft start / soft stop capability.
6. Bi-directional "Speed search" capability, in order to start a rotating load.
7. 14 preset and 1 custom volts per hertz pattern.
8. Heatsink over temperature speed fold back capability
9. Terminal status indication.
10. Program copy and storage in a removable digital operator.
11. Programmable security code
12. Current limit adjustment capability, from 30% to 200% of rated full load current of the VFD.
13. Motor pre-heat capability
14. Input signal or serial communication loss detection and response strategy.
15. Anti "wind-milling" function capability.

16. Automatic energy saving function.
17. Undertorque/Overtorque Detection.
18. Fan failure detection and selectable drive action
19. “Bumpless” transfer between Hand and Auto modes
20. Seven preset speeds
21. VFD shall include factory settings for all parameters, and the capability for those settings to be reset.
22. VFD shall include user parameter initialization capability to re-establish project specific parameters
23. VFD shall include programmable HVAC specific application macros
24. USB Type B port for quick and easy PC Connection
25. VFD shall include the capability to adjust the following functions, while the VFD is running:

1. Speed command input.
2. Acceleration adjustment from 0 to 6000 seconds.
3. Deceleration adjustment from 0 to 6000 seconds.
4. Select from 7 preset speeds.
5. Analog monitor display.
6. Removal of digital operator.

2.16 PRODUCT OPTIONS

Note to the Consulting Engineer; See Appendix One to Select Options to be Applied to a Specific Project

2.17 FABRICATION

A. All standard and optional features shall be included in a single NEMA 1, plenum rated enclosure with a UL certification label.

2.18 SOURCE QUALITY CONTROL

A. In-circuit testing of all printed circuit boards shall be conducted, to insure the proper mounting and correct value of all components.

B. Final printed circuit board assemblies shall be functionally tested, via computerized test equipment. All tests and acceptance criteria shall be preprogrammed. All test results shall be stored as detailed quality assurance data.

C. All fully assembled controls shall be functionally tested, with fully loaded induction motors. The combined test data shall then be analyzed, to insure adherence to quality assurance specifications.

D. Inspect and production test, under load, each completed VFD assembly.

PART 3 - EXECUTION

3.1 INSTALLATION – AIR HANDLING UNIT

A. Install in accordance with manufacturer's Installation & Maintenance instructions.

3.2 ENVIRONMENTAL REQUIREMENTS

A. Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

3.3 EXTRA MATERIALS

A. Provide extra set(s) [filters, etc.] for each unit as shown on project schedule.

3.4 INSTALLATION

A. NEMA ICS 3.

B. Tighten accessible connections and mechanical fasteners after placing VFD.

C. Provide a nameplate label on each VFD, identifying rated horsepower, full load amperes, model number, service factor and voltage/phase rating.

3.5 FIELD QUALITY CONTROL

A. Field inspection and testing to be performed under provisions of Section 01400.

B. Inspect completed installation for physical damage, proper alignment, anchorage, and grounding.

3.6 MANUFACTURER'S FIELD SERVICES

A. Prepare and start systems under provisions of Section 01400.

3.7 ADJUSTING

A. Carry out adjusting work under provisions of Section 01700. Make final adjustments to installed VFD, to assure proper operation of HVAC systems.

END OF SECTION 23 73 13

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SECTION 23 74 33 - FACTORY FABRICATED PACKAGED HEATING MAKE-UP AIR UNITS

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes modular rooftop filtered make-up air fan(s), designed to deliver fresh outside makeup air for installations requiring frequent air changes. Units are designed for indoor or outdoor applications and are available in vertical or horizontal discharge configurations.

1.2 SUBMITTALS

A. The manufacturer assumes no liability for the use or results of use of this document. This specification is to be reviewed by the engineer to confirm requirements of the project and building codes are met.

B. As the manufacturer continues product development, it reserves the right to change design and specifications without notice.

1.3 QUALITY ASSURANCE

A. ETL-Listed to listed and conforms to UL705 and CSA Std. C22.2.

B. Miami-Dade Certification - NOA-2 Supply

1.4 WARRANTY

A. All units are provided with the following 2-year standard warranty. Optional extended warranty available.

B. This warranty shall not apply if:

1. The equipment is not installed by a qualified installer per the manufacturer's installation instructions shipped with the product.
2. The equipment is not installed in accordance with Federal, State, and Local codes and regulations.
3. The equipment is misused, neglected, or not maintained per the manufacturer's maintenance instructions.
4. The equipment is not operated within its published capacity.
5. The invoice is not paid within the terms of the sales agreement.

C. The manufacturer shall not be liable for incidental and consequential losses and damages potentially attributable to malfunctioning equipment. Should any part of the equipment prove to be defective in material or workmanship within the 2-year warranty period, upon examination by the manufacturer, such part will be repaired or replaced by the manufacturer at no charge. The buyer shall pay all labor costs incurred in connection with such repair or replacement. Equipment shall not be returned without manufacturer's prior authorization, and all returned equipment shall

be shipped by the buyer, freight prepaid to a destination determined by the manufacturer.

PART 2 - PRODUCTS

2.1 Manufacturers

A. Subject to compliance with requirements, provides products by one of the following:

1. CaptiveAire
2. Halton
3. Sterling HVAC

2.2 GENERAL ASSEMBLY

A. Unit(s) shall be factory assembled, tested and shipped as a complete packaged assembly, for indoor or outdoor mounting, consisting of the following specifications, deliver all capacities scheduled, and conform to design indicated herein. Alternate layouts or dimensional changes will not be accepted.

2.3 CABINET

A. Unit(s) shall be constructed of minimum 20-gauge G-90 galvanized steel riveted together via structural pop-rivets. All metal shall be CNC bent for precise assembly.

1. Base Construction: The base shall be constructed of galvanized steel for improved rigidity. Base shall be structurally reinforced to accommodate the blower assembly.
2. Rigging Provisions: The unit shall have a structural base constructed of minimum 14-gauge G-90 galvanized steel, and include lifting points on all four sides.
3. Roof Construction: Roof shall be pitched to allow for proper drainage.
4. Exterior Wall Construction: All exterior walls shall consist of insulated galvanized steel construction.
5. Service Access Doors: All door jambs shall be gasketed around their perimeter. Doors may be mounted via spring actuated, stainless steel hinges with stainless steel rivets, and self-compressing stainless steel pad lockable latches or through removable sliding panels.
6. Each compartment shall have removable access panels to allow for ease of service and maintainability. Electrical cabinet doors shall be outfitted with schematic and/or manual pouches formed into the door, along with wiring diagram attached to the indoor of the door from the factory.

B. Entire interior and exterior casing shall be constructed of minimum 20-gauge G-90 galvanized steel with no painting, and shall have undergone a salt spray corrosion test as per ASTM B 117.

2.4 SUPPLY AIR BLOWER AND MOTOR

A. All supply fans shall be direct drive.

B. The blower assembly shall consist of a centrifugal backward inclined, non- overloading wheel

secured directly to a heavy-duty, ball bearing type motor via two set screws. The motor and wheel assembly shall be mounted to a heavy gauge galvanized steel frame. The motor shall be controlled by a variable frequency drive, allowing for variable airflow without the need of belts and pulleys.

C. Blower Motor: Motor shall be a premium efficiency motor available as:

1. Open Drip Proof (ODP) motor driven by a Variable Frequency Drive.
2. Totally Enclosed Fan Cooled (TEFC) motor driven by a Variable Frequency Drive.
3. Electronically Commutated Motor (ECM).
4. Explosion Proof.

D. Fans to be selected at or near efficiency peak. Check fan curves provided with job.

E. Blower and motor assembly shall be dynamically balanced. The entire blower and motor assembly shall be mounted on rubber vibration isolators. Wheels balanced as per AMCA 204-96; Balance Quality and Vibration Levels for fans.

2.5 SHAFTS AND BEARINGS

A. Shafts shall be precision ground and polished. Heavy duty, pre-lubricated bearings designed for, and individually tested, specifically for use in air handling applications.

2.6 AIRFLOW CONFIGURATIONS

A. Units 2 & 3 shall be configurable for down (vertical) discharge through unit.

B. Unit 1 shall be configurable for side (horizontal) discharge through the cabinet.

C. Unit intake airflow configuration shall be through use of a fresh/outdoor damper.

1. Damper: Manufacturer shall provide and install on unit, when possible, a two-position, motor-operated damper with internal end switch to energize the blower-starter circuit. Blades shall be a maximum of 6" wide 16-gauge G-90 galvanized steel and shall be made to guarantee the absence of noticeable vibration at design air velocities. Damper blades are to be mounted on friction-free synthetic bearings. Damper edges shall have PVC coated polyester fabric mechanically locked into blade edge. Jamb seals used are flexible metal, compression type. Damper shall exceed AMCA Class 1A standard for low leakage. Damper assembly shall be a single assembly, and outfitted with an integral bird screen and louver/gutter system to divert any drainage through the base of the unit – intake air hood not required.
2. Actuator: A single direct drive damper actuator shall be used with spring return to ensure that the outdoor air section opens when not powered.
3. Discharge Diffuser Selections: 180° Side Discharge, Three-way down diffusion, Four-way down diffusion, or 45° down diffusion.

2.7 VARIABLE AIR VOLUME

A. Separate 120V Wiring Package (Required and used only for DCV or Prewire with VFD) - Three Phase Only

B. VAV Package w/ Manual Control for Non Tempered Units (VFD Included). Controls are to be fully

installed and integrated to the kitchen exhaust hoods, by the kitchen contractor.

2.8 INTAKE

A. Possible configurations include: Screened Intake, and Trunkline.

B. Optional purchase: Extra set of intake filters.

2.9 CURB

A. Full Perimeter Curb

B. Paint Option: Not Painted

C. Insulated

D. Burglar Bars

E. Welded Bottom Corners

F. 16 Gauge

G. MPU Clips

2.10 HEATING SYSTEM

A. Heating coil section shall be field bolted directly to unit section. Coil section to be designed to fit onto common curb with main unit.

B. Casing and roof to be 20-gauge G-90 galvanized construction. Inside of section to be fully insulated with foil back insulation.

C. Hot water heating module to meet scheduled requirements.

2.11 FILTERS

A. Provide filters as part of unit. All filters shall be furnished and installed to meet the performance requirements set forth in the schedule and as specified under another section of this work.

B. The filters shall be (2") thick, aluminum mesh coated with super-filter adhesive, aluminum mesh with polyester foam or pleated throw away.

C. Aluminum-mesh filters shall have aluminum frames with media to be layers of slit and expanded aluminum, varying in pattern to obtain maximum depth loading.

D. Washable 2" filters shall be enclosed in two-piece, die-cut frame with diagonal supports. Frame shall be constructed of heavy-duty beverage board. Filter media is supported on the air leaving side by a metal grid.

E. All filters shall be installed on tracks for easy removal from the unit.

F. Shall be either insulated or non-insulated constructed of G-90 galvanized steel with filters supported by internal slides and with removable access panels.

G. Unit shall have an optional adjustable pressure differential sensor for the filter bank to alert in the event of a clogged filter.

2.12 ELECTRICAL

A. All controls shall be pre-wired and housed in an insulated electrical cabinet within the unit to protect against risk of condensation.

B. All units shall be provided with single point electrical connection.

C. Unit shall be provided with a door safety switch that de-energizes the supply fan when the door is opened.

D. The electrical cabinet shall be outfitted with the following:

1. LED electrical cabinet service light with automatic activation upon door switch.
2. Color wiring schematics, laminated to the interior wall of the cabinet doors.
3. Factory mounted disconnect with unit bottom knockouts.
4. A LED backlit, LCD Human-Machine Interface (HMI) shall be mounted within the unit's control cabinet to allow for all setpoints configuration and refrigeration system monitoring at the unit.
5. Up to 4 additional space mounted HMIs available. Additional HMIs shall allow for full programming capabilities and are outfitted with integral temperature and humidity sensors. Additional HMIs shall be capable of being individually averaged for space temperature/humidity readings. All HMIs shall be wired using standard CAT5/6 cables.
6. Controls shall be furnished and installed by division 12 and shall be integrated to the BMS.

2.13 OPTIONS

A. Coil Ecoating

B. Gravity Dampers

C. Indoor Hanging Cradle

D. Painted Coatings

E. 6 Pole 40 Amp Rotary Motor Disconnect

F. Convenience Outlet

G. Extended Power Drop

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine all areas and conditions under which packaged units are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Installer.

3.2 INSTALLATION

A. Install units in accordance with manufacturer's instructions, drawings, written specifications, manufacturer’s installation manual and all applicable building codes.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties. Install piping to allow service and maintenance.

B. Duct installation requirements are specified in other Division 23 Sections. Drawings indicate the general arrangement of ducts.

C. Electrical connections conform to applicable requirements in Division 26 Sections.

3.4 SYSTEM START-UP

A. System start-up is performed by a factory-trained Service Technician.

END OF SECTION 23 74 33

SECTION 23 82 33 – Finned Tube Radiators

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following:

1. Hydronic baseboard radiators.

1.3 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each type of product indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Plans, elevations, sections, and details.
2. Details of custom-fabricated enclosures indicating dimensions.
3. Location and size of each field connection.
4. Location and arrangement of piping valves and specialties.
5. Location and arrangement of integral controls.
6. Enclosure joints, corner pieces, access doors, and other accessories.
7. Wiring Diagrams: Power, signal, and control wiring.

C. Coordination Drawings: Floor plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Structural members, including wall construction, to which convection units will be attached.
2. Method of attaching convection units to building structure.
3. Penetrations of fire-rated wall and floor assemblies.

D. Color Samples for Initial Selection: For units with factory-applied color finishes.

E. Color Samples for Verification: For each type of exposed finish required.

F. Field quality-control test reports.

G. Operation and Maintenance Data: For convection heating units to include in emergency, operation, and maintenance manuals.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

PART 2 - PRODUCTS

2.1 HOT-WATER BASEBOARD RADIATORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. Embassy Industries, Inc.
2. Slant/Fin.
3. Sterling

D. Performance Ratings: Rate baseboard radiators according to Hydronics Institute's "I=B=R Testing and Rating Standard for Baseboard Radiation."

E. Heating Elements: Copper tubing mechanically expanded into flanged collars of evenly spaced aluminum fins resting on polypropylene element glides. One end of tube shall be belled.

1. Tube Diameter: [NPS 3/4 (DN 20).
2. Fin Size: [3 1/4 by 3 1/4 inches
3. Fin Spacing: 48 per foot
4. Heat Output: 240 Btu/h/ft. (W/m)
5. Average Water Temperature: 120 deg F
6. Minimum Water Velocity: 1/4 fps

F. Enclosures: Minimum 0.0428-inch- (1.1-mm-)thick steel, removable front cover.

1. Full-height back.
2. Full-length damper.
3. End panel.
4. End caps.
5. Inside and outside corners.
6. Valve access door.
7. Joiner pieces to snap together.
8. Enclosure Height: 8 1/2 inches.

9. Enclosure Depth: 3 1/2 inches.
10. Finish: Baked-enamel finish in manufacturer's custom color as selected by Architect.
11. Element Brackets: Primed and painted steel to support front panel and element.

G. Floor-Mounting Pedestals: Conceal insulated piping at maximum 36-inch (914-mm) spacing. Pedestal-mounting back panel shall be solid panel matching front panel. Provide stainless-steel escutcheon for floor openings at pedestals.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive convection heating units for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for hydronic-piping connections to verify actual locations before convection heating unit installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 BASEBOARD RADIATOR INSTALLATION

A. Install units level and plumb.

B. Install baseboard radiators according to Guide 2000 - Residential Hydronic Heating.

C. Install enclosure continuously around corners, using outside and inside corner fittings.

D. Join sections with splice plates and filler pieces to provide continuous enclosure.

E. Install access doors for access to valves.

F. Install enclosure continuously from wall to wall.

G. Terminate enclosures with manufacturer's end caps except where enclosures are indicated to extend to adjoining walls.

H. Install valves within reach of access door provided in enclosure.

I. Install air-seal gasket between wall and recessing flanges or front cover of fully recessed unit.

J. Install piping within pedestals for freestanding units.

3.3 CONNECTIONS

A. Piping installation requirements are specified in Division 23 Section "[Hydronic Piping] Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect hot-water units and components to piping according to Division 23 Section "Hydronic Piping."

1. Install shutoff valves on inlet and outlet, and balancing valve on outlet.

C. Connect steam units and components to piping according to Division 23 Section "Steam and Condensate Heating Piping."

1. Install shutoff valve on inlet; install strainer, steam trap, and shutoff valve on outlet.

D. Install control valves as required by Division 23 Section "Instrumentation and Control for HVAC."

E. Install piping adjacent to convection heating units to allow service and maintenance.

F. Ground electric convection heating units according to Division 26 Section "Grounding and Bonding for Electrical Systems."

G. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Perform the following field tests and inspections and prepare test reports:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper convection heating unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

B. Remove and replace convection heating units that do not pass tests and inspections and retest as specified above.

END OF SECTION 23 82 33

SECTION 23 82 39 - UNIT HEATERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Cabinet unit heaters with centrifugal fans and hot-water coils.
2. Propeller unit heaters with hot-water coils.
3. Wall and ceiling heaters with propeller fans and electric-resistance heating coils.

1.3 DEFINITIONS

A. BAS: Building automation system.

B. CWP: Cold working pressure.

C. PTFE: Polytetrafluoroethylene plastic.

D. TFE: Tetrafluoroethylene plastic.

1.4 SUBMITTALS

A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.

B. LEED Submittal:

1. Product Data for Prerequisite EQ 1: Documentation indicating that units comply with ASHRAE 62.1-2004, Section 5 - "Systems and Equipment."

C. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Plans, elevations, sections, and details.
2. Location and size of each field connection.
3. Details of anchorages and attachments to structure and to supported equipment.
4. Equipment schedules to include rated capacities, operating characteristics, furnished specialties, and accessories.

5. Location and arrangement of piping valves and specialties.
6. Location and arrangement of integral controls.
7. Wiring Diagrams: Power, signal, and control wiring.

D. Coordination Drawings: Floor plans, reflected ceiling plans, and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which unit heaters will be attached.
3. Method of attaching hangers to building structure.
4. Size and location of initial access modules for acoustical tile.
5. Items penetrating finished ceiling, including the following:

   a. Lighting fixtures.
   b. Air outlets and inlets.
   c. Speakers.
   d. Sprinklers.
   e. Access panels.

6. Perimeter moldings for exposed or partially exposed cabinets.

E. Samples for Initial Selection: Finish colors for units with factory-applied color finishes.

F. Samples for Verification: Finish colors for each type of cabinet unit heater and wall and ceiling heaters indicated with factory-applied color finishes.

G. Manufacturer Seismic Qualification Certification: Submit certification that cabinet unit heaters, accessories, and components will withstand seismic forces defined in Division 23 Section "Vibration and Seismic Controls for HVAC Piping and Equipment." Include the following:

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

   a. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."
   b. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

H. Field quality-control test reports.

I. Operation and Maintenance Data: For cabinet unit heaters to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."

C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Cabinet Unit Heater Filters: Furnish one spare filter(s) for each filter installed.

PART 2 - PRODUCTS

2.1 CABINET UNIT HEATERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings

D. Description: A factory-assembled and -tested unit complying with ARI 440.

1. Comply with UL 2021.

E. Coil Section Insulation: ASTM C 1071; surfaces exposed to airstream shall be aluminum-foil facing to prevent erosion of glass fibers.

1. Thickness: 1/2 inch (13 mm).
2. Thermal Conductivity (k-Value): 0.26 Btu x in./h x sq. ft. at 75 deg F (0.037 W/m x K at 24 deg C) mean temperature.
3. Fire-Hazard Classification: Maximum flame-spread index of 25 and smoke-developed index of 50 when tested according to ASTM E 84.
4. Adhesive: Comply with ASTM C 916 and with NFPA 90A or NFPA 90B.
5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

F. Cabinet: Steel with baked-enamel finish with manufacturer's custom paint, in color selected by Architect.

1. Vertical Unit, Exposed Front Panels: Minimum 0.0528-inch- (1.35-mm- thick, galvanized, sheet steel, removable panels with channel-formed edges secured with tamperproof cam fasteners.
2. Horizontal Unit, Exposed Bottom Panels: Minimum 0.0528-inch- (1.35-mm-) thick, galvanized, sheet steel, removable panels secured with tamperproof cam fasteners and safety chain.
3. Recessing Flanges: Steel, finished to match cabinet.
4. Control Access Door: Key operated.
5. Base: Minimum 0.0528-inch- (1.35-mm-) thick steel, finished to match cabinet, 4 inches (100 mm) high with leveling bolts.
6. Extended Piping Compartment: 8-inch- (200-mm wide piping end pocket.
7. False Back: Minimum 0.0428-inch- (1.1-mm-) thick steel, finished to match cabinet.

G. Filters: Minimum arrestance according to ASHRAE 52.1 and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.

1. Washable Foam: 70 percent arrestance and 3 MERV.
2. Glass Fiber Treated with Adhesive: 80 percent arrestance and 5 MERV.
3. Pleated: 90 percent arrestance and 7 MERV.

H. Hot-Water Coil: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch (2.5 mm) and rated for a minimum working pressure of 200 psig (1378 kPa) and a maximum entering-water temperature of 220 deg F (104 deg C). Include manual air vent and drain.

I. Fan and Motor Board: Removable.

1. Fan: Forward curved, high static, double width, centrifugal; directly connected to motor. Thermoplastic or painted-steel wheels, and aluminum, painted-steel, or galvanized-steel fan scrolls.
2. Motor: Permanently lubricated, multispeed; resiliently mounted on motor board. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
3. Wiring Terminations: Connect motor to chassis wiring with plug connection.

J. Factory, Hot-Water Piping Package: ASTM B 88, Type L (ASTM B 88M, Type B) copper tube with wrought-copper fittings and brazed joints. Label piping to indicate service, inlet and outlet.

1. Two-way, modulating control valve.
2. Hose Kits: Minimum 400-psig (2758-kPa) working pressure, and operating temperatures from 33 to 211 deg F (0.5 to 99 deg C). Tag hose kits to equipment designations.
   a. Length: 24 inches (600 mm).
   b. Minimum Diameter: Equal to cabinet unit heater connection size.

3. Two-Piece, Ball Valves: Bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600-psig (4140-kPa) minimum CWP rating and blowout-proof stem.
4. Calibrated-Orifice Balancing Valves: Bronze body, ball type, 125-psig (860-kPa) working pressure, 250 deg F (121 deg C) maximum operating temperature; with calibrated orifice or venture, connection for portable differential pressure meter with integral seals, threaded ends, and equipped with a memory stop to retain set position.

5. Automatic Flow-Control Valve: Brass or ferrous-metal body, 300-psig (2068-kPa) working pressure at 250 deg F (121 deg C), with removable, corrosion-resistant, tamperproof, self-cleaning, piston-spring; factory set to maintain constant indicated flow with plus or minus 10 percent over differential pressure range of 2 to 80 psig (13.8 to 552 kPa).
6. Y-Pattern, Hot-Water Strainers: Cast-iron body (ASTM A 126, Class B); 125-psig (860-kPa) minimum working pressure; with threaded connections, bolted cover, perforated stainless-steel basket, and bottom drain connection. Include minimum NPS 1/2 (DN 15) threaded pipe and full-port ball valve in strainer drain connection.
7. Wrought-Copper Unions: ASME B16.22.

K. Control devices and operational sequences are specified in Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls."

L. Basic Unit Controls:

1. Refer to drawings H-501 through H-504 for unit controls.

M. DDC Terminal Controller:

1. Refer to drawings H-501 through H-504 for unit controls.

N. BAS Interface Requirements:

1. Refer to drawings H-501 through H-504 for unit controls.

O. Electrical Connection: Factory wire motors and controls for a single field connection.

P. Capacities and Characteristics:

1. Cabinet:
   a. Vertical, Surface Mounted: Upflow.
      1) Top: Flat or sloped.
      2) Air Inlet: Open bottom Front, extruded-aluminum bar grille.
      3) Air Outlet: Front or top, extruded-aluminum bar grille.
   b. Vertical, Surface Mounted: Downflow.
      1) Top: Flat or sloped.
      2) Air Inlet: Front or top, extruded-aluminum bar grille.
      3) Air Outlet: Front, extruded-aluminum bar grille.

2.2 PROPELLER UNIT HEATERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dayton
2. Trane.
3. Vulcan

C. Description: An assembly including casing, coil, fan, and motor in [vertical] [and] [horizontal] discharge configuration with adjustable discharge louvers.

D. Comply with UL 2021.

E. Comply with UL 823.

F. Cabinet: Removable panels for maintenance access to controls.

G. Cabinet Finish: Manufacturer's standard baked enamel applied to factory-assembled and - tested propeller unit heater before shipping.

H. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

I. Discharge Louver: Adjustable fin diffuser for horizontal units and conical diffuser for vertical units.

J. General Coil Requirements: Test and rate hot-water propeller unit heater coils according to ASHRAE 33.

K. Hot-Water Coil: Copper tube, minimum 0.025-inch (0.635-mm) wall thickness, with mechanically bonded aluminum fins spaced no closer than 0.1 inch (2.5 mm) and rated for a minimum working pressure of 200 psig (1380 kPa) and a maximum entering-water temperature of 325 deg F (163 deg C), with manual air vent. Test for leaks to 350 psig (2413 kPa) underwater.

L. Fan: Propeller type with aluminum wheel directly mounted on motor shaft in the fan venturi.

M. Fan Motors: Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

1. Motor Type: Permanently lubricated, [explosion proof] [multispeed] [variable speed].

N. Control devices and operational sequences are specified in Division 23 Sections "Instrumentation and Control for HVAC" and "Sequence of Operations for HVAC Controls."

O. Basic Unit Controls:

1. Refer to drawings H-501 through H-504 for unit controls.

P. DDC Terminal Controller:

1. Refer to drawings H-501 through H-504 for unit controls.

Q. BAS Interface Requirements:

1. Refer to drawings H-501 through H-504 for unit controls.

2.3 WALL AND CEILING HEATERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings

D. Description: An assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.

E. Cabinet:

1. Front Panel: Extruded-aluminum bar grille, with removable panels fastened with tamperproof fasteners.
2. Finish: Baked enamel over baked-on primer with manufacturer's custom color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.
3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.

F. Surface-Mounting Cabinet Enclosure: Steel with finish to match cabinet.

G. Fan: Aluminum propeller directly connected to motor.

1. Motor: Permanently lubricated, multispeed. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."

H. Controls: Unit-mounted thermostat. Low-voltage relay with transformer kit.

I. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

J. Capacities and Characteristics:

1. Airflow: As indicated on Drawings.
2. See Drawings for Electrical Characteristics for Single-Point Connection.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive unit heaters for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in for piping and electrical connections to verify actual locations before unit heater installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall boxes in finished wall assembly; seal and weatherproof. Joint-sealant materials and applications are specified in Division 07 Section "Joint Sealants."

B. Install cabinet unit heaters to comply with NFPA 90A.

C. Install propeller unit heaters level and plumb.

D. Suspend cabinet unit heaters from structure with elastomeric hangers and vibration isolators.

E. Suspend propeller unit heaters from structure with all-thread hanger rods and elastomeric hangers. Hanger rods and attachments to structure are specified in Division 23 Section "Hangers and Supports for HVAC Piping and Equipment."

F. Install wall-mounting thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.

G. Install new filters in each fan-coil unit within two weeks of Substantial Completion.

3.3 CONNECTIONS

A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to machine to allow service and maintenance.

C. Connect piping to cabinet unit heater's factory, hot-water piping package. Install the piping package if shipped loose.

D. Connect supply and return ducts to cabinet unit heaters with flexible duct connectors specified in Division 23 Section "Air Duct Accessories."

E. Comply with safety requirements in UL 1995.

F. Unless otherwise indicated, install union and gate or ball valve on supply-water connection and union and calibrated balancing valve on return-water connection of unit heater. Hydronic specialties are specified in Division 23 Section "Hydronic Piping."

G. Unless otherwise indicated, install union and gate or ball valve on steam-supply connection and union, strainer, steam trap, and gate or ball valve on condensate-return connection of unit heater. Steam specialties are specified in Division 23 Section "Steam and Condensate Heating Piping."

H. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."

I. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections. Report results in writing.

B. Perform the following field tests and inspections and prepare test reports:

1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.

C. Remove and replace malfunctioning units and retest as specified above.

3.5 ADJUSTING

A. Adjust initial temperature set points.

B. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain cabinet unit heaters. Refer to Division 01 Section "Demonstration and Training."

END OF SECTION 23 82 39

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SECTION 260010 - SUPPLEMENTAL REQUIREMENTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies supplemental requirements generally applicable to the Work specified in Division 26. This Section is also referenced by related Work specified in other Divisions.

1.2 REFERENCES

A. Abbreviations and Acronyms for Electrical Terms and Units of Measure:

1. 8P8C: An 8-position 8-contact modular jack.
2. A: Ampere, unit of electrical current.
3. AC or ac: Alternating current.
4. AFCI: Arc-fault circuit interrupter.
5. AIC: Ampere interrupting capacity.
6. AL, Al, or ALUM: Aluminum.
7. ASD: Adjustable-speed drive; also called variable-frequency drive (VFD).
8. ATS: Automatic transfer switch.
9. AWG: American wire gauge; see ASTM B258.
10. BAS: Building automation system.
11. BIL: Basic impulse insulation level.
12. BIM: Building information modeling.
13. CAD: Computer-aided design or drafting.
14. CATV: Community antenna television.
15. CB: Circuit breaker.
16. cd: Candela, the SI fundamental unit of luminous intensity.
17. CO/ALR: Copper-aluminum, revised.
18. COPS: Critical operations power system.
19. CU or Cu: Copper.
20. CU-AL or AL-CU: Copper-aluminum.
21. dB: Decibel, a unitless logarithmic ratio of two electrical, acoustical, or optical power values.
22. dB(A-weighted) or dB(A): Decibel acoustical sound pressure level with A-weighting applied in accordance with IEC 61672-1.
23. dB(adjusted) or dBa: Decibel weighted absolute noise power with respect to 3.16 pW (minus 85 dBm).
24. dBm: Decibel absolute power with respect to 1 mW.
25. DC or dc: Direct current.
26. DCOA: Designated critical operations area.
27. DDC: Direct digital control (HVAC).
28. EGC: Equipment grounding conductor.
29. ELV: Extra-low voltage.

30. EMF: Electromotive force.
31. EMI: Electromagnetic interference.
32. EPM: Electrical preventive maintenance.
33. EPS: Emergency power supply.
34. EPSS: Emergency power supply system.
35. ESS: Energy storage system.
36. EV: Electric vehicle.
37. EVPE: Electric vehicle power export equipment.
38. EVSE: Electric vehicle supply equipment.
39. fc: Footcandle, an internationally recognized unit of illuminance equal to one lumen per square foot or 10.76 lx. The simplified conversion 1 fc = 10 lx in the Specifications is common practice and considered adequate precision for building construction activities. When there are conflicts, lux is the primary unit; footcandle is specified for convenience.
40. FLC: Full-load current.
41. ft: Foot.
42. ft-cd: Foot-candle, the antiquated U.S. Standard unit of illuminance, equal to one international candle measured at a distance of one foot, that was superseded in 1948 by the unit "footcandle" after the SI unit candela (cd) replaced the international candle; see "fc,"
43. GEC: Grounding electrode conductor.
44. GFCI: Ground-fault circuit interrupter.
45. GFPE: Ground-fault protection of equipment.
46. GND: Ground.
47. HACR: Heating, air conditioning, and refrigeration.
48. HDPE: High-density polyethylene.
49. HID: High-intensity discharge.
50. HP or hp: Horsepower.
51. HVAC: Heating, ventilating, and air conditioning.
52. Hz: Hertz.
53. IBT: Intersystem bonding termination.
54. inch: Inch. To avoid confusion, the abbreviation "in." is not used.
55. IP: Ingress protection rating (enclosures); Internet protocol (communications).
56. IR: Infrared.
57. IS: Intrinsically safe.
58. IT&R: Inspecting, testing, and repair.
59. ITE: Information technology equipment.
60. kAIC: Kiloampere interrupting capacity.
61. kcmil or MCM: One thousand circular mils.
62. kV: Kilovolt.
63. kVA: Kilovolt-ampere.
64. kVAr or kVAR: Kilovolt-ampere reactive.
65. kW: Kilowatt.
66. kWh: Kilowatt-hour.
67. LAN: Local area network.
68. lb: Pound (weight).
69. lbf: Pound (force).
70. LCD: Liquid-crystal display.
71. LCDI: Leakage-current detector-interrupter.

72. LED: Light-emitting diode.
73. Li-ion: Lithium-ion.
74. lm: Lumen, the SI derived unit of luminous flux.
75. LNG: Liquefied natural gas.
76. LP-Gas: Liquefied petroleum gas.
77. LRC: Locked-rotor current.
78. LV: Low voltage.
79. lx: Lux, the SI derived unit of illuminance equal to one lumen per square meter.
80. m: Meter.
81. MCC: Motor-control center.
82. MDC: Modular data center.
83. MG set: Motor-generator set.
84. MIDI: Musical instrument digital interface.
85. MLO: Main lugs only.
86. MV: Medium voltage.
87. MVA: Megavolt-ampere.
88. mW: Milliwatt.
89. MW: Megawatt.
90. MWh: Megawatt-hour.
91. NC: Normally closed.
92. Ni-Cd: Nickel-cadmium.
93. Ni-MH: Nickel-metal hydride.
94. NIU: Network interface unit.
95. NO: Normally open.
96. NPT: National (American) standard pipe taper.
97. OCPD: Overcurrent protective device.
98. ONT: Optical network terminal.
99. PC: Personal computer.
100. PCS: Power conversion system.
101. PCU: Power-conditioning unit.
102. PF or pf: Power factor.
103. PHEV: Plug-in hybrid electric vehicle.
104. PLC: Programmable logic controller.
105. PLFA: Power-limited fire alarm.
106. PoE: Power over Ethernet.
107. PV: Photovoltaic.
108. PVC: Polyvinyl chloride.
109. pW: Picowatt.
110. RFI: (electrical) Radio-frequency interference; (contract) Request for interpretation.
111. RMS or rms: Root-mean-square.
112. RPM or rpm: Revolutions per minute.
113. SCADA: Supervisory control and data acquisition.
114. SCR: Silicon-controlled rectifier.
115. SPD: Surge protective device.
116. sq.: Square.
117. SWD: Switching duty.
118. TCP/IP: Transmission control protocol/Internet protocol.
119. TEFC: Totally enclosed fan-cooled.

120. TR: Tamper resistant.
121. TVSS: Transient voltage surge suppressor.
122. UL: (standards) Underwriters Laboratories, Inc.; (product categories) UL, LLC.
123. UL CCN: UL Category Control Number.
124. UPS: Uninterruptible power supply.
125. USB: Universal serial bus.
126. UV: Ultraviolet.
127. V: Volt, unit of electromotive force.
128. V(ac): Volt, alternating current.
129. V(dc): Volt, direct current.
130. VA: Volt-ampere, unit of complex electrical power.
131. VAR: Volt-ampere reactive, unit of reactive electrical power.
132. VFC: Variable-frequency controller.
133. VOM: Volt-ohm-multimeter.
134. VPN: Virtual private network.
135. VRLA: Valve regulated lead acid; also called "sealed lead acid (SLA)" or "valve regulated sealed lead acid."
136. W: Watt, unit of real electrical power.
137. Wh: Watt-hour, unit of electrical energy usage.
138. WPT: Wireless power transfer.
139. WPTE: Wireless power transfer equipment.
140. WR: Weather resistant.

B. Abbreviations and Acronyms for Electrical Raceway Types:

1. CR: Communications raceway.
2. CR-GP: General-purpose communications raceway.
3. CR-P: Plenum communications raceway.
4. CR-R: Riser communications raceway.
5. EMT: Electrical metallic tubing.
6. EMT-A: Aluminum electrical metallic tubing.
7. EMT-S: Steel electrical metallic tubing.
8. EMT-SS: Stainless steel electrical metallic tubing.
9. ENT: Electrical nonmetallic tubing.
10. EPEC: Electrical HDPE underground conduit (thin wall).
11. EPEC-A: Type A electrical HDPE underground conduit.
12. EPEC-B: Type B electrical HDPE underground conduit.
13. ERMC: Electrical rigid metal conduit.
14. ERMC-A: Aluminum electrical rigid metal conduit.
15. ERMC-S: Steel electrical rigid metal conduit.
16. ERMC-S-G: Galvanized-steel electrical rigid metal conduit.
17. ERMC-S-PVC: PVC-coated-steel electrical rigid metal conduit.
18. ERMC-SS: Stainless steel electrical rigid metal conduit.
19. FMC: Flexible metal conduit.
20. FMC-A: Aluminum flexible metal conduit.
21. FMC-S: Steel flexible metal conduit.
22. FMT: Steel flexible metallic tubing.
23. FNMC: Flexible nonmetallic conduit. See "LFNC."

24. HDPE: HDPE underground conduit (thick wall).
25. HDPE-40: Schedule 40 HDPE underground conduit.
26. HDPE-80: Schedule 80 HDPE underground conduit.
27. IMC: Steel electrical intermediate metal conduit.
28. LFMC: Liquidtight flexible metal conduit.
29. LFMC-A: Aluminum liquidtight flexible metal conduit.
30. LFMC-S: Steel liquidtight flexible metal conduit.
31. LFMC-SS: Stainless steel liquidtight flexible metal conduit.
32. LFNC: Liquidtight flexible nonmetallic conduit.
33. LFNC-A: Layered (Type A) liquidtight flexible nonmetallic conduit.
34. LFNC-B: Integral (Type B) liquidtight flexible nonmetallic conduit.
35. LFNC-C: Corrugated (Type C) liquidtight flexible nonmetallic conduit.
36. PVC: Rigid PVC conduit.
37. PVC-40: Schedule 40 rigid PVC conduit.
38. PVC-80: Schedule 80 rigid PVC Conduit.
39. PVC-A: Type A rigid PVC concrete-encased conduit.
40. PVC-EB: Type EB rigid PVC concrete-encased underground conduit.
41. RGS: See ERMC-S-G.
42. RMC: See ERMC.
43. RTRC: Reinforced thermosetting resin conduit.
44. RTRC-AG: Low-halogen, aboveground reinforced thermosetting resin conduit.
45. RTRC-AG-HW: Heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
46. RTRC-AG-SW: Standard wall, low-halogen, aboveground reinforced thermosetting resin conduit.
47. RTRC-AG-XW: Extra heavy wall, low-halogen, aboveground reinforced thermosetting resin conduit.
48. RTRC-BG: Low-halogen, belowground reinforced thermosetting resin conduit.

C. Abbreviations and Acronyms for Electrical Single-Conductor and Multiple-Conductor Cable Types:

1. AC: Armored cable.
2. CATV: Coaxial general-purpose cable.
3. CATVP: Coaxial plenum cable.
4. CATVR: Coaxial riser cable.
5. CI: Circuit integrity cable.
6. CL2: Class 2 cable.
7. CL2P: Class 2 plenum cable.
8. CL2R: Class 2 riser cable.
9. CL2X: Class 2 cable, limited use.
10. CL3: Class 3 cable.
11. CL3P: Class 3 plenum cable.
12. CL3R: Class 3 riser cable.
13. CL3X: Class 3 cable, limited use.
14. CM: Communications general-purpose cable.
15. CMG: Communications general-purpose cable.
16. CMP: Communications plenum cable.

17. CMR: Communications riser cable.
18. CMUC: Under-carpet communications wire and cable.
19. CMX: Communications cable, limited use.
20. DG: Distributed generation cable.
21. FC: Flat cable.
22. FCC: Flat conductor cable.
23. FPL: Power-limited fire-alarm cable.
24. FPLP: Power-limited fire-alarm plenum cable.
25. FPLR: Power-limited fire-alarm riser cable.
26. IGS: Integrated gas spacer cable.
27. ITC: Instrumentation tray cable.
28. ITC-ER: Instrumentation tray cable, exposed run.
29. MC: Metal-clad cable.
30. MC-HL: Metal-clad cable, hazardous location.
31. MI: Mineral-insulated, metal-sheathed cable.
32. MTW: (machine tool wiring) Moisture-, heat-, and oil-resistant thermoplastic cable.
33. MV: Medium-voltage cable.
34. NM: Nonmetallic sheathed cable.
35. NMC: Nonmetallic sheathed cable with corrosion-resistant nonmetallic jacket.
36. NMS: Nonmetallic sheathed cable with signaling, data, and communications conductors, plus power or control conductors.
37. NPLF: Non-power-limited fire-alarm circuit cable.
38. NPLFP: Non-power-limited fire-alarm circuit cable for environmental air spaces.
39. NPLFR: Non-power-limited fire-alarm circuit riser cable.
40. NUCC: Nonmetallic underground conduit with conductors.
41. OFC: Conductive optical fiber general-purpose cable.
42. OFCG: Conductive optical fiber general-purpose cable.
43. OFCP: Conductive optical fiber plenum cable.
44. OFCR: Conductive optical fiber riser cable.
45. OFN: Nonconductive optical fiber general-purpose cable.
46. OFNG: Nonconductive optical fiber general-purpose cable.
47. OFNP: Nonconductive optical fiber plenum cable.
48. OFNR: Nonconductive optical fiber riser cable.
49. P: Marine shipboard cable.
50. PLTC: Power-limited tray cable.
51. PLTC-ER: Power-limited tray cable, exposed run.
52. PV: Photovoltaic cable.
53. RHH: (high heat) Thermoset rubber, heat-resistant cable.
54. RHW: Thermoset rubber, moisture-resistant cable.
55. SA: Silicone rubber cable.
56. SE: Service-entrance cable.
57. SER: Service-entrance cable, round.
58. SEU: Service-entrance cable, flat.
59. SIS: Thermoset cable for switchboard and switchgear wiring.
60. TBS: Thermoplastic cable with outer braid.
61. TC: Tray cable.
62. TC-ER: Tray cable, exposed run.
63. TC-ER-HL: Tray cable, exposed run, hazardous location.

64. THW: Thermoplastic, heat- and moisture-resistant cable.
65. THHN: Thermoplastic, heat-resistant cable with nylon jacket outer sheath.
66. THHW: Thermoplastic, heat- and moisture-resistant cable.
67. THWN: Thermoplastic, moisture- and heat-resistant cable with nylon jacket outer sheath.
68. TW: Thermoplastic, moisture-resistant cable.
69. UF: Underground feeder and branch-circuit cable.
70. USE: Underground service-entrance cable.
71. XHH: Cross-linked polyethylene, heat-resistant cable.
72. XHHW: Cross-linked polyethylene, heat- and moisture-resistant cable.

D. Abbreviations and Acronyms for Electrical Flexible Cord Types:

1. SEO: 600 V extra-hard-usage, hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp locations.
2. SEOW: 600 V extra-hard-usage, hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp or wet locations.
3. SEOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp locations.
4. SEOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer covering for damp or wet locations.
5. SJEO: 300 V hard-usage, junior hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp locations.
6. SJEOW: 300 V hard-usage, junior hard-service cord with thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp or wet locations.
7. SJEOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp locations.
8. SJEOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic elastomer insulation and oil-resistant thermoplastic elastomer outer cover for damp or wet locations.
9. SJO: 300 V hard-usage, junior hard-service cord with thermoset insulation and oil-resistant thermoset outer cover for damp locations.
10. SJOW: 300 V hard-usage, junior hard-service cord with thermoset insulation and oil-resistant thermoset outer cover for damp or wet locations.
11. SJOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer cover for damp locations.
12. SJOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer cover for damp or wet locations.
13. SJTO: 300 V hard-usage, junior hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer cover for damp locations.
14. SJTOW: 300 V hard-usage, junior hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer cover for damp or wet locations.
15. SJTOO: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer cover for damp locations.

16. SJTOOW: 300 V hard-usage, junior hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer cover for damp or wet locations.
17. SO: 600 V extra-hard-usage, hard-service cord with thermoset insulation and oil-resistant thermoset outer covering for damp locations.
18. SOW: 600 V extra-hard-usage, hard-service cord with thermoset insulation and oil-resistant thermoset outer covering for damp or wet locations.
19. SOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer covering for damp locations.
20. SOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoset insulation and oil-resistant thermoset outer covering for damp or wet locations.
21. STO: 600 V extra-hard-usage, hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer covering for damp locations.
22. STOW: 600 V extra-hard-usage, hard-service cord with thermoplastic insulation and oil-resistant thermoplastic outer covering for damp or wet locations.
23. STOO: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer covering for damp locations.
24. STOOW: 600 V extra-hard-usage, hard-service cord with oil-resistant thermoplastic insulation and oil-resistant thermoplastic outer covering for damp or wet locations.

E. Definitions:

1. 8-Position 8-Contact (8P8C) Modular Jack: An unkeyed jack with up to eight contacts commonly used to terminate twisted-pair and multiconductor Ethernet cable. Also called a "TIA-1096 miniature 8-position series jack" (8PSJ), or an "IEC 8877 8-pole jack."
    a. Be careful when suppliers use "RJ45" generically. Obsolete RJ45 jacks used for analog telephone cables have rejection keys. 8P8C jacks used for digital telephone cables and Ethernet cables do not have rejection keys.
2. Basic Impulse Insulation Level (BIL): Reference insulation level expressed in impulse crest voltage with a standard wave not longer than 1.5 times 50 microseconds and 1.5 times 40 microseconds.
3. Cable: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "cable" is (1) a conductor with insulation, or a stranded conductor with or without insulation (single-conductor cable); or (2) a combination of conductors insulated from one another (multiple-conductor cable).
4. Communications Jack: A fixed connecting device designed for insertion of a communications cable plug.
5. Communications Outlet: One or more communications jacks, or cables and plugs, mounted in a box or ring, with a suitable protective cover.
6. Conductor: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "conductor" is (1) a wire or combination of wires not insulated from one another, suitable for carrying an electric current; (2) (National Electrical Safety Code) a material, usually in the form of wire, cable, or bar, suitable for carrying an electric current; or (3) (general) a substance or body that allows a current of electricity to pass continuously along it.

7. Designated Seismic System: A system component that requires design in accordance with Ch. 13 of ASCE/SEI 7 and for which the Component Importance Factor is greater than 1.0.
8. Direct Buried: Installed underground without encasement in concrete or other protective material.
9. Enclosure: The case or housing of an apparatus, or the fence or wall(s) surrounding an installation, to prevent personnel from accidentally contacting energized parts or to protect the equipment from physical damage. Types of enclosures and enclosure covers include the following:

    a. Cabinet: An enclosure that is designed for either surface mounting or flush mounting and is provided with a frame, mat, or trim in which a swinging door or doors are or can be hung.
    b. Concrete Box: A box intended for use in poured concrete.
    c. Conduit Body: A means for providing access to the interior of a conduit or tubing system through one or more removable covers at a junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
    d. Conduit Box: A box having threaded openings or knockouts for conduit, EMT, or fittings.
    e. Cutout Box: An enclosure designed for surface mounting that has swinging doors or covers secured directly to and telescoping with the walls of the enclosure.
    f. Device Box: A box with provisions for mounting a wiring device directly to the box.
    g. Extension Ring: A ring intended to extend the sides of an outlet box or device box to increase the box depth, volume, or both.
    h. Floor Box: A box mounted in the floor intended for use with a floor box cover and other components to complete the floor box enclosure.
    i. Floor-Mounted Enclosure: A floor box and floor box cover assembly with means to mount in the floor that is sealed against the entrance of scrub water at the floor level.
    j. Floor Nozzle: An enclosure used on a wiring system, intended primarily as a housing for a receptacle, provided with a means, such as a collar, for surface-mounting on a floor, which may or may not include a stem to support it above the floor level, and is sealed against the entrance of scrub water at the floor level.
    k. Junction Box: A box with a blank cover that joins different runs of raceway or cable and provides space for connection and branching of the enclosed conductors.
    l. Outlet Box: A box that provides access to a wiring system having pryout openings, knockouts, threaded entries, or hubs in either the sides or the back, or both, for the entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting an outlet box cover, but without provisions for mounting a wiring device directly to the box.
    m. Pedestal Floor Box Cover: A floor box cover that, when installed as intended, provides a means for typically vertical or near-vertical mounting of receptacle outlets above the floor's finished surface.
    n. Pull Box: A box with a blank cover that joins different runs of raceway and provides access for pulling or replacing the enclosed cables or conductors.
    o. Raised-Floor Box: A floor box intended for use in raised floors.

p. Recessed Access Floor Box: A floor box with provisions for mounting wiring devices below the floor surface.
q. Recessed Access Floor Box Cover: A floor box cover with provisions for passage of cords to recessed wiring devices mounted within a recessed floor box.
r. Ring: A sleeve, which is not necessarily round, used for positioning a recessed wiring device flush with the plaster, concrete, drywall, or other wall surface.
s. Ring Cover: A box cover, with raised center portion to accommodate a specific wall or ceiling thickness, for mounting wiring devices or luminaires flush with the surface.
t. Termination Box: An enclosure designed for installation of termination base assemblies consisting of bus bars, terminal strips, or terminal blocks with provision for wire connectors to accommodate incoming or outgoing conductors, or both.

10. Emergency Systems: Those systems legally required and classed as emergency by municipal, state, federal, or other codes, or by any governmental agency having jurisdiction that are designed to ensure continuity of lighting, electrical power, or both, to designated areas and equipment in the event of failure of the normal supply for safety to human life.
11. Essential Electrical Systems: (healthcare facilities) Those systems designed to ensure continuity of electrical power to designated areas and functions of a healthcare facility during disruption of normal power sources, and also to minimize disruption within the internal wiring system.
12. Fault Limited: Providing or being served by a source of electrical power that is limited to not more than 100 W when tested in accordance with UL 62368-1.

    a. The term "fault limited" is intended to encompass most Class 1, 2, and 3 power-limited sources complying with Article 725 of NFPA 70; Class ES1 and ES2 electrical energy sources that are Class PS1 electrical power sources (e.g., USB); and Class ES3 electrical energy sources that are Class PS1 and PS2 electrical power sources (e.g., PoE). See UL 62368-1 for discussion of classes of electrical energy sources and classes of electrical power sources.

13. High-Performance Building: A building that integrates and optimizes on a life-cycle basis all major high-performance attributes, including energy conservation, environment, safety, security, durability, accessibility, cost-benefit, productivity, sustainability, functionality, and operational considerations.
14. Jacket: A continuous nonmetallic outer covering for conductors or cables.
15. Luminaire: A complete lighting unit consisting of a light source such as a lamp, together with the parts designed to position the light source and connect it to the power supply. It may also include parts to protect the light source or the ballast or to distribute the light.
16. Mode: The terms "Active Mode," "Off Mode," and "Standby Mode" are used as defined in the Energy Independence and Security Act (EISA) of 2007.
17. Multi-Outlet Assembly: A type of surface, flush, or freestanding raceway designed to hold conductors, receptacles, and switches, assembled in the field or at the factory.
18. Plenum: A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system.
19. Receptacle: A fixed connecting device arranged for insertion of a power cord plug. Also called a power jack.

20. Receptacle Outlet: One or more receptacles mounted in a box with a suitable protective cover.
21. Sheath: A continuous metallic covering for conductors or cables.
22. UL Category Control Number (CCN): An alphabetic or alphanumeric code used to identify product categories covered by UL's Listing, Classification, and Recognition Services.
23. Voltage Class: For specified circuits and equipment, voltage classes are defined as follows:

    a. Control Voltage: Having electromotive force between any two conductors, or between a single conductor and ground, that is supplied from a battery or other Class 2 or Class 3 power-limited source.
    b. Line Voltage: (1) (controls) Designed to operate using the supplied low-voltage power without transformation. (2) (transmission lines, transformers, SPDs) The line-to-line voltage of the supplying power system.
    c. Extra-Low Voltage (ELV): Not having electromotive force between any two conductors, or between a single conductor and ground, exceeding 30 V(ac rms), 42 V(ac peak), or 60 V(dc).
    d. Low Voltage (LV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 30 V but not exceeding 1000 V.
    e. Medium Voltage (MV): Having electromotive force between any two conductors, or between a single conductor and ground, that is rated about 1 kV but not exceeding 69 kV.
    f. High Voltage: (1) (circuits) Having electromotive force between any two conductors, or between a single conductor and ground, that is rated above 69 kV but not exceeding 230 kV. (2) (safety) Having sufficient electromotive force to inflict bodily harm or injury.

24. Wire: In accordance with NIST NBS Circular 37 and IEEE standards, in the United States for the purpose of interstate commerce, the definition of "wire" is a slender rod or filament of drawn metal. A group of small wires used as a single wire is properly called a "stranded wire." A wire or stranded wire covered with insulation is properly called an "insulated wire" or a "single-conductor cable." Nevertheless, when the context indicates that the wire is insulated, the term "wire" will be understood to include the insulation.

1.3 COORDINATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions:

1. Notify Construction Manager no fewer than seven(7) days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service Construction Manager's written permission.
3. Coordinate interruption with systems impacted by outage including, but not limited to, the following:

a. Exercising generators.
b. Emergency lighting.
c. Elevators.
d. Fire-alarm systems.

B. Arrange to provide temporary electrical power in accordance with requirements specified in Division 01.

1.4 PREINSTALLATION MEETINGS

A. Electrical Preconstruction Conference: Schedule conference with Architect and Owner, not later than ten 10 days after notice to proceed. Agenda topics include, but are not limited to, the following:

1. Electrical installation schedule.
2. Status of power system studies.
3. Value analysis proposals and requests for substitution of electrical equipment.
4. Utility work coordination and class of service requests.
5. Commissioning activities.
6. Sustainability activities, including Measurement and Verification Plan.

1.5 SEQUENCING

A. Conduct and submit results of power system studies before submitting Product Data and Shop Drawings for electrical equipment.

1.6 SCHEDULING

A. Coordinate all activities with Construction Manager.

1.7 ACTION SUBMITTALS

A. Coordination drawings.

1.8 INFORMATIONAL SUBMITTALS

A. Electrical installation schedule.

B. Qualification statements.

C. Welding certificates.

D. Delegated design drawings for structural masonry wall penetrations.

1.9 CLOSEOUT SUBMITTALS

A. Facility EPM program binders.

B. Operation and maintenance data.

C. Software and firmware operational documentation.

1.10 QUALITY ASSURANCE

A. Qualifications: Prepare and submit qualification statements for the following entities performing Work on Project:

1. Qualified Regional Manufacturer: Manufacturer, possessing qualifications specified in Section 014000 "Quality Requirements," that maintains a service center capable of providing training, parts, and emergency on-site repairs to Project site with response time less than four (4)time.
2. Structural Professional Engineer: Professional engineer possessing active qualifications specified in Section 014000 "Quality Requirements," with expertise in structural engineering, including seismic- and wind-load modeling and analysis.
3. Electrical Professional Engineer: Professional engineer possessing active qualifications specified in Section 014000 "Quality Requirements," with expertise in electrical engineering, including electrical power system modeling and analysis of electrical safety in accordance with NFPA 70E.
4. Lighting Professional Engineer: Professional engineer possessing active qualifications in accordance with Section 014000 "Quality Requirements" and the following:

    a. Expertise in electrical engineering, lighting design, and structural requirements for exterior poles and standards.
    b. Lighting Certified (LC) Professional by the National Council on Qualifications for the Lighting Professions (NCQLP).

5. EPM Specialist: Recognized experts possessing the following qualifications in accordance with Section 014000 "Quality Requirements" and NFPA 70B:

    a. Technical Competence: Person should, by education, training, and experience, be well-rounded in all aspects of electrical maintenance.
    b. Administrative and Supervisory Skills: Person should be skilled in planning and development of long-range objectives to achieve specific results and should be able to command respect and solicit cooperation of persons involved in EPM Program development.

6. Welder: Installer possessing active qualifications specified in Section 014000 "Quality Requirements," with training and certification in accordance with AWS D1.1/D1.1M.
7. ERMC-S-PVC Installers: Installer possessing active qualifications specified in Section 014000 "Quality Requirements," and able to present unexpired certified Installer credentials issued by ERMC-S-PVC manufacturer prior to starting installation.

8. Medium-Voltage Cable Installer: Entity possessing active qualifications specified in Section 014000 "Quality Requirements" with training and manufacturer certification to install, splice, and terminate medium-voltage cable in accordance with Central Hudson's requirements.

    a. Medium-voltage cable Installer must be approved by Central Hudson**.**

9. Medium-Voltage Duct Installer: Entity possessing active qualifications specified in Section 014000 "Quality Requirements" with documented training and experience with installation of medium-voltage duct banks in accordance with Central Hudson's requirements.

    a. Medium-voltage duct Installer must be approved by Central Hudson.

10. Medium-Voltage Equipment Installer: Entity possessing active qualifications specified in Section 014000 "Quality Requirements" with documented training and experience with hazards and safety requirements associated with installation and operation of medium-voltage equipment in accordance with Central Hudson's requirements.

    a. Medium-voltage equipment Installer must be approved by Central Husdon

11. Electrical Power Monitoring Installers: Installer possessing active qualifications specified in Section 014000 "Quality Requirements," and able to present unexpired certified Installer credentials issued by manufacturer prior to starting installation.
12. EVSE Installers: Installer possessing active qualifications specified in Section 014000 "Quality Requirements," and able to present unexpired certified Installer credentials issued by EVSE manufacturer prior to starting installation.
13. Generator Set Installers: Installer possessing active qualifications specified in Section 014000 "Quality Requirements," and able to present unexpired certified Installer credentials issued by generator set manufacturer prior to starting installation.
14. Power Quality Specialist: Recognized experts possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction, and able to present unexpired NICET Level 4 credentials with documented experience in power quality testing for installations similar in complexity to this Project.
15. Low-Voltage Electrical Testing and Inspecting Agency: Entities possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.

    a. On-site electrical testing supervisors must have documented certification and experience with testing electrical equipment in accordance with NETA testing standards.

16. Medium-Voltage Electrical Testing and Inspecting Agency: Entities possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.

a. On-site electrical testing supervisors must have documented certification and experience with testing electrical equipment in accordance with NETA testing standards.

17. Power-Limited Electrical Testing Agency: Entity possessing active credentials from a qualified electrical testing laboratory recognized by authorities having jurisdiction.

    a. On-site power-limited testing supervisor must have BICSI Registered Communications Distribution Designer certification and documented training and experience with testing power-limited equipment in accordance with NETA testing standards.

18. Structural Testing and Inspecting Agency: Entity possessing active qualifications specified in Section 014000 "Quality Requirements" with documented training and experience with testing structural concrete, seismic controls, and wind-load controls.
19. Luminaire Photometric Testing Laboratory: Entity possessing active qualifications specified in Section 014000 "Quality Requirements" accredited under the NVLAP for Energy Efficient Lighting Products, and complying with applicable IES testing standards.
20. Lighting Testing and Inspecting Agency: Entity possessing active qualifications specified in Section 014000 "Quality Requirements" with documented training and experience with testing and inspecting lighting installations in accordance with IES LM-5.

B. Certifications:

1. Seismic-Load Performance Certificates: Provide special certification for designated seismic systems as indicated in Paragraph 13.2.2 "Special Certification Requirements for Designated Seismic Systems" of ASCE/SEI 7-05 for all designated seismic-load systems identified on Drawings or in the Specifications.

    a. Include the following information:

        1) Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
        2) Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
        3) Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
        4) Detailed description of conduit support devices and interconnections on which the certification is based and their installation requirements.
        5) Provide equipment manufacturer's written certification for each designated active electrical seismic device and system, stating that it will remain operable following the design earthquake. Certification must be based on requirements of ASCE/SEI 7, including shake table testing per ICC-ES AC156 or a similar nationally recognized testing standard procedure acceptable to authorities having jurisdiction**,** or experience data as permitted by[ASCE/SEI 7-05.

6) Provide equipment manufacturer's written certification that components with hazardous contents maintain containment following the design earthquake by methods required in ASCE/SEI 7-05.
7) Submit evidence demonstrating compliance with these requirements for approval to authorities having jurisdiction after review and acceptance by qualified structural professional engineer.

1.11 FIELD CONDITIONS

A. Modeling, analysis, product selection, installation, and quality control for Work specified in Division 26 must comply with requirements specified. Service Conditions for Electrical Power Equipment: must be suitable for operation under service conditions specified as usual service conditions in applicable NEMA PB series, IEEE C37 series, and IEEE C57 series standards, except for the following:

1. Locations:<
   a. Ambient temperature not exceeding 140 deg F.
   b. Exposure to hot and humid climate or to excessive moisture, including steam, salt spray, and dripping water.
   c. Unusual transportation or storage conditions.
   d. Unusual grounding resistance conditions.
   e. Unusual space limitations.

PART 2 - PRODUCTS

2.1 SUBSTITUTION LIMITATIONS FOR ELECTRICAL EQUIPMENT

A. Substitution requests for electrical equipment will be entertained under the following conditions:

1. Notification of Contractor's intent to request substitutions for convenience must be declared during the Electrical Preconstruction Conference so potential risks to system performance and construction schedule may be identified for Contractor's response in submission of the substitution request. Submission of requests for substitutions for convenience must meet the conditions and deadline specified in Section 012500 "Substitution Procedures" to receive approval.
2. For electrical equipment and systems, substitutions for cause are considered major construction risks. If it is possible that Contractor may need to request substitutions for cause because of equipment unavailability, or inability to meet construction schedule because of lead time, Contractor must declare the possibility during the Electrical Preconstruction Conference to permit establishing a mitigation plan for minimizing risks to system performance and construction schedule.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Field inspect and verify all existing / as-built conditions on site prior to start of work.

B. Preinstallation Testing:

1. Test and record conditions for all systems impacted by construction activities.

C. Evaluation and Assessment

1. Provide written report to Construction Manager documenting existing operating conditions for all systems impacted by Construction Activities.

3.2 PREPARATION

A. Electrical Installation Schedule: At preconstruction meeting, and periodically thereafter as dates change, provide schedule for electrical installation Work to Owner and Architect including, but not limited to, milestone dates for the following activities:

1. Submission of power system studies.
2. Submission of specified coordination drawings.
3. Submission of action submittals specified in Division 26.
4. Orders placed for major electrical equipment.
5. Arrival of major electrical equipment on-site.
6. Preinstallation meetings specified in Division 26.
7. Utility service outages.
8. Utility service inspection and activation.
9. Mockup reviews.
10. Closing of walls and ceilings containing electrical Work.
11. System startup, testing, and commissioning activities for major electrical equipment.
12. System startup, testing, and commissioning activities for emergency lighting.
13. System startup, testing, and commissioning activities for automation systems (SCADA, BMS, lighting, HVAC, fire alarm, fire pump, etc.).
14. Pouring of concrete housekeeping pads for electrical equipment and testing of concrete samples.
15. Requests for special inspections.
16. Requests for inspections by authorities having jurisdiction.

B. Coordination Drawings for Structural Supports: Show coordination of structural supports for equipment and devices, including restraints and bracing for control of seismic and wind loads, with other systems, equipment, and structural supports in the vicinity.

C. Coordination Drawings for Ceiling Areas: Where indicated on drawings, provide reflected ceiling plan(s), supplemented by sections and other details, drawn to scale, in accordance with Section 013100 "Project Management and Coordination," on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Suspended ceiling components.
2. Structural members to which equipment, luminaires, and suspension systems will be attached.
3. Partitions and millwork that penetrate ceiling or extend to within 12 -inch of plane of luminaires.
4. Size and location of access panels on ceilings.
5. Elevation, size, and route of sprinkler piping.
6. Elevation, size, and route of plumbing piping.
7. Elevation, size, and route of ductwork.
8. Elevation, size, and route of cable tray.
9. Elevation, size, and route of conduit.
10. Elevation and size of wall-mounted and ceiling-mounted equipment.
11. Moldings.
12. Access panels.
13. Sprinklers.
14. Air inlets and outlets.
15. Control modules.
16. Luminaires.
17. Communications devices.
18. Speakers.
19. Ceiling-mounted projectors.
20. Security devices.
21. Fire-alarm devices.
22. Indicate clear dimensions for maintenance access in front of equipment.
23. Indicate dimensions of fully-open access doors.

D. Coordination Drawings for Cable Tray Routing: Reflected ceiling plan(s), supplemented by sections and other details, drawn to scale, in accordance with Section 013100 "Project Management and Coordination," on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Elevation, size, and route of cable trays.
2. Relationships between components and adjacent structural, electrical, and mechanical elements.
3. Vertical and horizontal offsets and transitions.
4. Elevation and size of sleeves for wall, ceiling, and floor cable penetrations.
5. Elevation of ceilings and size of ceiling tiles.
6. Locations of access panels on ceilings.
7. Locations where cable tray crosses or parallels sprinkler piping.
8. Locations where cable tray crosses plumbing piping.
9. Locations where cable tray crosses or parallels ductwork.
10. Locations of access panels on ductwork.
11. Locations where cable tray crosses conduit.

12. Items blocking access around cable trays, including the following:

    a. Light fixtures.
    b. Speakers.
    c. Fire-alarm devices.
    d. Power outlets.
    e. Wall-mounted equipment.
    f. Equipment racks.
    g. Furniture.
    h. Door swings.
    i. Building features.

13. Indicate clear dimension between cable tray and walls or obstructions that are closer than 10 ft.
14. Highlight locations where cable tray is greater than 3 ft above ceilings. Explain how personnel access will be accommodated for cable tray maintenance.

E. Coordination Drawings for Conduit Routing: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Structural members in paths of conduit groups with common supports.
2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

F. Coordination Drawings for Bus Assembly Routing: Floor plans and sections, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:

1. Scaled bus-assembly layouts and relationships between components and adjacent structural, mechanical, and electrical elements.
2. Vertical and horizontal enclosed bus-assembly runs, offsets, and transitions.
3. Clearances for access above and to the side of enclosed bus assemblies.
4. Vertical elevation of enclosed bus assemblies above the floor or bottom of structure.
5. Support locations, type of support, and weight on each support.
6. Location of adjacent construction elements including luminaires, HVAC and plumbing equipment, fire sprinklers and piping, signal and control devices, and other equipment.

G. Coordination Drawings for Large Equipment Indoor Installations:

1. Location plan, drawn to scale, showing heavy equipment or truck access paths to loading dock or other freight access into building. Indicate available width and height of doors or openings.
2. Floor plan for entry floor and floor where equipment is located, drawn to scale, showing heavy equipment access paths for maintenance and replacement, with the following items shown and coordinated with each other, based on input from installers of the items involved:

a. Dimensioned concrete bases, outlines of equipment, conduit entries, and grounding equipment locations.
b. If freight elevator must be used, indicate width and height of door and depth of car. Indicate if large equipment must be tipped to use elevator.
c. Dimensioned working clearances and dedicated areas below and around electrical equipment where obstructions and tripping hazards are prohibited.

3. Reflected ceiling plans for entry floor and floor where equipment is located, drawn to scale, on which the following items shown and coordinated with each other, based on input from installers of the items involved:

a. Support locations, type of support, and weight on each support. Locate structural supports for structure-supported raceways, busways, and seismic bracing.
b. Location of lighting fixtures, sprinkler piping and sprinklers, ducts and diffusers, and other obstructions, indicating available overhead clearance.
c. Dimensioned working clearances and dedicated areas above and around electrical equipment where foreign systems and equipment are prohibited.

H. Coordination Drawings for Large Equipment Outdoor Installations:

1. Utilities site plan, drawn to scale, showing heavy equipment or truck access paths for maintenance and replacement, with the following items shown and coordinated with each other, based on input from installers of the items involved:

a. Fences and walls, dimensioned concrete bases, outlines of equipment, conduit entries, and grounding and bonding locations.
b. Indicate clear dimensions for fence gates and wall openings.
c. Indicate depth and type of ground cover, and locations of trees, shrubbery, and other obstructions in access path.
d. Indicate clear height below tree branches, overhead lines, bridges, and other overhead obstructions in access path, or where cranes and hoists will be needed to handle large electrical equipment.
e. Support locations, type of support, and weight on each support. Locate structural supports for structure-supported raceways, busways, and seismic bracing.
f. Dimensioned working clearances and dedicated areas around electrical equipment.

I. Coordination Drawings for Duct Banks:

1. Show duct profiles and coordination with other utilities and underground structures.
2. Include plans and sections, drawn to scale, and show bends and locations of expansion fittings.

3.3 DELEGATED DESIGN OF STRUCTURAL PENETRATIONS

A. Engage qualified structural professional engineer to design penetrations of structural masonry walls.

B. Delegated Design Drawings for Structural Masonry Wall Penetrations: Where indicated on Drawings, provide reflected ceiling plan(s), supplemented by elevations, sections, and other details, drawn to scale, signed and sealed by a qualified structural professional engineer, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Location and dimensions of structural members supporting wall.
2. Location and dimensions of columns near penetrations.
3. Location and dimension of headers and lintels.
4. Doors and windows near penetrations.
5. Location and dimensions of penetrating cuts.
6. Sprinkler piping and sleeves.
7. Plumbing piping and sleeves.
8. Ductwork and sleeves.
9. Cable tray and sleeves.
10. Conduit and sleeves.
11. Firestopping assemblies for rated penetrations.
12. Structural supports for piping, ductwork, and conduit on both sides of wall.

C. Delegated Design Criteria: As depicted on Drawings.

3.4 INSTALLATION OF ELECTRICAL WORK

A. Unless more stringent requirements are specified in the Contract Documents or manufacturers' written instructions, comply with NFPA 70 and NECA NEIS 1 for installation of Work specified in Division 26. Consult Architect for resolution of conflicting requirements.

3.5 FIELD QUALITY CONTROL

A. Administrant for Medium-Voltage Electrical Tests and Inspections:

1. Engage qualified medium-voltage electrical testing and inspecting agency to administer and perform tests and inspections.
2. Engage qualified medium-voltage electrical testing and inspecting agency to administer and perform tests and inspections.
3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
4. Administer and perform tests and inspections with assistance of factory-authorized service representative.

B. Administrant for Low-Voltage Electrical Tests and Inspections:

1. Engage qualified low-voltage electrical testing and inspecting agency to administer and perform tests and inspections.
2. Engage qualified low-voltage electrical testing and inspecting agency to administer and perform tests and inspections.

3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
4. Administer and perform tests and inspections with assistance of factory-authorized service representative.

C. Administrant for Power-Limited Electrical Tests and Inspections:

1. Engage qualified power-limited electrical testing and inspecting agency to administer and perform tests and inspections.
2. Engage qualified power-limited electrical testing and inspecting agency to administer and perform tests and inspections.
3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
4. Administer and perform tests and inspections with assistance of factory-authorized service representative.

D. Administrant for Structural Tests and Inspections:

1. Engage qualified structural testing and inspecting agency to administer and perform tests and inspections.
2. Engage qualified structural testing and inspecting agency to administer and perform tests and inspections.
3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
4. Administer and perform tests and inspections with assistance of factory-authorized service representative.

E. Administrant for Field Tests and Inspections of Lighting Installations:

1. Engage qualified lighting testing and inspecting agency to administer and perform tests and inspections.
2. Engage qualified lighting testing and inspecting agency to administer and perform tests and inspections.
3. Engage factory-authorized service representative to administer and perform tests and inspections on components, assemblies, and equipment installations, including connections.
4. Administer and perform tests and inspections with assistance of factory-authorized service representative.

3.6 CLEANING

A. Waste Management:

3.7 CLOSEOUT ACTIVITIES

A. Operation and Maintenance Data: Prepare and submit the following:

1. Provide emergency operation, normal operation, and preventive maintenance manuals for each system, equipment, and device listed below:

2. Include the following information:

a. Manufacturer's operating specifications.
b. User's guides for software and hardware.
c. Schedule of maintenance material items recommended to be stored at Project site.
d. Detailed instructions covering operation under both normal and abnormal conditions.
e. Time-current curves for overcurrent protective devices and manufacturer's written instructions for testing and adjusting their settings.
f. List of load-current and overload-relay heaters with related motor nameplate data.
g. List of lamp types and photoelectric relays used on Project, with ANSI and manufacturers' codes.
h. Manufacturer's instructions for setting field-adjustable components.
i. Manufacturer's instructions for testing, adjusting, and reprogramming microprocessor controls.
j. EPSS: Manufacturer's system checklists, maintenance schedule, and maintenance log sheets in accordance with NFPA 110.
k. Exterior pole inspection and repair procedures.
l. Include copies of demonstration and training videos.

END OF SECTION 260010

SECTION 26 05 00 – COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section and to all of Divisions 26.

1.2 SUMMARY

A. Section Includes:

1. General requirements applicable to components and systems included in Electric Contract.

B. Products Installed but Not Furnished Under This Section

1. Make electrical connections to equipment shown on Drawings and furnished by other Contractors. Obtain approved wiring diagrams and location drawings for roughing in and final connections from Contractor furnishing equipment.

1.3 REFERENCES

A. AIA American Institute of Architects
B. ADA Americans with Disabilities Act
C. AISC American Institute of Steel Construction
D. ANSI American National Standards Institute
E. ASTM ASTM International
F. IBC International Building Code
G. IEEE Institute of Electrical and Electronics Engineers, Inc. (The)
H. IES Illuminating Engineering Society of North America
I. NEC National Electrical Code
J. NEMA National Electrical Manufacturers' Association
K. NETA International Electrical Testing Association
L. NFPA National Fire Protection Association
M. UL Underwriters' Laboratories, Inc.

1.4 DEFINITIONS

A. “Existing To Remain”: Equipment depicted on Drawings with an “ETR” designation denotes existing equipment to remain.

B. “Relocate”: Equipment depicted on Drawings with an “R” designation denotes existing equipment to relocate. Disconnect equipment, remove circuitry to a point beyond demolition and tag for reuse, store equipment for reuse and reinstall as specified in Contract Documents.

Modify/extend circuitry to new equipment locations and reconnect. The Contractor is responsible for protecting equipment from damage during removal, storage and reinstallation.

C. “Replace Existing”: Equipment depicted on Drawings with an “RE” designation denotes existing equipment to replace. Refer to relevant Project Manual Specification for additional information and requirements.

D. “Circuitry”: The term circuitry shall have the same meaning as all required conductors, raceway, disconnects, and all associated components to provide for a complete and fully operating circuit. Inclusive of all materials so implied either on the drawings or in these specifications.

E. "Provide": The term provide shall have the same meaning as "furnish and install". All materials so implied either on the drawings or in these specifications shall be furnished and installed unless specifically noted otherwise.

1.5 SYSTEM DESCRIPTIONS

A. Inspection of Existing Systems: Inspect each existing system scheduled for modification in presence of Authorized Owner’s Representative and issue a deficiency report to Owner and Architect listing conditions found prior to any removals, relocations, or additions. Modified systems include (but are not limited to):

1. Power distribution.
2. Lighting.
3. Emergency lighting.

B. Design Requirements - Provide complete systems, properly tested, balanced, and ready for operation including necessary details, items and accessories although not expressly shown or specified, including (but not limited to):

1. Wiring and raceway for work specified in Project Manual and shown on Drawings.
2. Electrical devices and equipment for work specified in Project Manual and shown on Drawings.
3. Systems included, but not limited to:
   a. Electrical distribution.
   b. Electrical connections.
   c. Lighting.
   d. Emergency lighting.

C. Electric Layouts: Arrange panels; disconnect switches, enclosed breakers, equipment, raceways, and similar components neatly, orderly and symmetrically. Provide 3/4-inch fire treated, gray painted plywood backboards for surface-mounted panels, disconnect switches, enclosed breakers, and similar equipment, unless noted otherwise. Arrangements shown on Drawings are diagrammatic only; provide and adjust raceways, wiring, and other components as required.

D. Power Interruptions and Scheduled Outages: Coordinate scheduling of all power interruptions and outages with Owner. Confirm with Owner prior to interruption of power, which building systems are considered critical and must remain operational during the interruption. If a

scheduled power outage is to extend beyond one standard workday, provide temporary power to operate critical building systems (including, but not limited to fire alarm system, security system, building access control system, and building energy management control system).

1.6 SUBMITTALS

A. General Division 26 submittal requirements:

1. Comply with the requirements of SECTION 013300 – SUBMITTAL PROCEDURES and as modified below.

2. Product Data: Submit product data for items listed in individual technical section. Clearly identify manufacturer, pertinent design, function, materials, construction and performance data specifically addressing specification description and Contract Document requirements of item. Strike out products that are not applicable to item being submitted, where more than one product is indicated on manufacturer product literature.

   a. Cover Sheet: Attach cover sheet, identified in Section 01 33 00, to Product Data of each item submitted. Provide cover sheet for only one type of item with related accessories, equipment with related components. Do not combine unrelated items under the same cover sheet.

   b. Specified Equivalent Product Data: Submit manufacturer's product information including product literature, technical specifications and descriptions, performance data and, and similar items to demonstrate compatibility with Basis-of-Design Equipment as specified in the "Part 2 – Products" of each technical section.

3. Shop Drawings: Submit detailed drawings for electrical equipment layouts, showing exact sizes and locations for approval before beginning work.

   a. Do not proceed with installation of systems in each area until agreement is reached with all concerned on exact arrangements for each room or area, unless otherwise directed by Architect. If Contractor proceeds prior to resolving conflicts, Contractor shall modify installed Work as required to permit other systems to proceed with a coordinated installation.

   b. Specified Equivalent Drawings: Submit detailed drawings of proposed Specified Equivalents, indicating proposed installation of equipment and showing maintenance clearances, required service removal space other pertinent revisions to arrangement and configuration shown in Contract Documents.

4. Samples: On all submittals, indicate standard factory color and factory finish surfaces. Where more than one color is available, selection will be made by Architect from manufacturer's full range of colors. Electronically transmitted color samples are not acceptable.

1.7 ACTION SUBMITTALS

A. Product Data: For each type of product. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for sleeves and sleeve seals. Include rated capacities, and furnished specialties and accessories.

1. Penetration firestopping materials.

2. Penetration firestopping assembly drawings.

1.8 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Codes and Standards: Comply with applicable Federal, State and local building and electrical codes, laws, ordinances, and regulations, and comply with applicable NFPA, National Electrical Code and utility company requirements and regulations. Provide Underwriters Laboratories Seal on all materials.

2. Permits and Inspections: Obtain approvals, tests, and inspections required by Architect, Engineer, local electrical inspector, agent or agency specified in Project Manual, or National, State, or local codes and ordinances.

   a. Schedule electrical inspection by an agency acceptable to the local authority having jurisdiction and submit final inspection certificate to Architect.

   b. Furnish materials and labor necessary for tests and pay costs associated with tests and inspections.

   c. Conduct tests under load for load balancing and where required by codes, regulations, ordinances, or technical Specification.

3. Electrical Components, Devices, and Accessories: UL Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction and marked for intended use.

1.9 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection:

1. Take precautions to store materials and products to protect finishes and not permit dust and dirt to penetrate equipment.

2. Replace equipment damaged beyond reasonable repair as required by Architect.

3. Refinish any equipment with marks, stains, scratches, dents, and other aesthetic damage that doesn't impede operation of equipment as required by Architect.

1.10 COORDINATION OF WORK

A. New Construction:

1. Openings, Chases, Recesses, Sleeves, Lintels and Bucks (required for admission of Electric Contract systems and components): Coordinate requirements with General Contractor for inclusion in General Contract. Furnish necessary information (e.g. locations and sizes) to General Contractor in ample time for installation of systems and components included in Electric Contract.

2. Anchor Bolts: Deliver to Contractor responsible for General Work anchor bolts required for Electric Contract construction that are to be installed in construction included in General Contract.

3. Locate settings, check locations as installation in General Contract progresses, and provide templates or holding fixtures as required to maintain proper accuracy.

B. Existing Construction:

1. Unless otherwise specified, employ Contractor responsible for General Work for all cutting, patching, repairing and replacing of general work required for installation of systems and components included in Electric Work. Secure approval from Architect's representative before cutting.

2. Anchor Bolts: Deliver to Contractor responsible for General Work anchor bolts required for Electric Work construction that are to be installed in construction included in General Contract. Provide templates or holding fixtures as required to maintain proper accuracy.

3. Access Doors: Provide access doors shown on Drawings, or as required for access to pull boxes, junction boxes, relays and other electrical devices requiring periodic inspection, adjustment or maintenance, where located above or within inaccessible walls or ceilings, and including cutting and patching of adjacent walls and ceilings to match existing materials and finishes.

1.11 ALTERATION PROCEDURES

A. In locations where existing devices are indicated to be disconnected and removed and existing power circuit or communications cable is not scheduled to be reused:

1. Remove abandoned circuit conductors back to source.

2. Modify panel directory for that circuit.

3. Remove all existing exposed and unexposed accessible raceway.

4. Provide blank cover plates or wall infill (as indicated on plans) and as described below:

a. For single gang and multi-gang switch boxes in public or occupied spaces; stainless steel coverplates.

b. For single gang and multi-gang boxes in un-occupied spaces; stainless steel, galvanized steel or PVC coverplates.

c. For boxes larger than standard switch boxes in public or occupied spaces; remove existing box and provide wall infill, matching existing sub-surface and finished surface conditions. Paint wall to match surrounding finishes.

d. For boxes larger than standard switch boxes in un-occupied spaces; 18 gage galvanized sheet metal coverplate with machined edges. Prime and paint to match surrounding finish conditions.

5. Patch and paint existing walls where disturbed by the electrical work. Retain Contractor experience in the particular field of work.

B. In locations where existing devices are to remain in place, ensure circuits feeding such devices remain operational. Modify existing circuits as required to allow new construction to occur and to maintain necessary circuitry to existing devices for complete and proper operation.

C. In locations where entire existing system is being removed or modified:

1. Refer to individual system specification sections for documentation and inspection requirements prior to any alteration work on any system.
2. Take all necessary measures to ensure that down time will not compromise safety.
3. Notify Owner, Architect and other Contractors not less than 2 weeks prior to interruptions in service.
4. Coordinate work schedule to minimize duration of system outage during hours when building is occupied.

PART 2 - PRODUCTS

2.1 PENETRATION FIRESTOPPING

A. Comply with requirements for sealants in fire rated penetrations specified in Section 078413 “Penetration Firestopping”.

B. Submit Manufacturers Product Data Sheets for each type of product selected. Certify that Firestop Material is free of asbestos and lead paint, and complies with local regulations.

1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.

C. Submit system design listings, including illustrations from qualified testing and inspection agency that is applicable to each firestop configuration.

D. Submit a project specific Penetration Firestopping Schedule indicating where each firestop configuration will be used.

2.2 GROUT

A. Description: ASTM C 1107, Grade B, non-shrink, non-metallic, high strength grout, suitable for interior and exterior, above and below grade applications.

1. Characteristics: Post-hardening, volume-adjusting, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.3 SEALANTS

A. Comply with requirements for sealants in non-fire rated penetrations specified in Section 07 92 00 "Joint Sealants."

B. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

   a. BASF Building Systems; Omniplus.
   b. Dow Corning Corporation; 786 Mildew Resistant.
   c. GE Advanced Materials - Silicones; Sanitary SCS1700.

2.4 ACCESS DOORS

A. Comply with requirements for access doors specified in Section 083113 “Access Doors and Frames” for product requirements.

2.5 PAINT AND FINISHES

A. Refer to Division 09 for painting and finishing.

PART 3 - EXECUTION

3.1 CUTTING AND PATCHING

A. Do not cut waterproof floors or walls for admission of any equipment or materials and do not pierce any structural members without written permission from Architect.

B. Furnish and install sleeves, inserts, panels, raceways, boxes, and similar infrastructure., ahead of general construction work and maintain Contractor personnel at Site during installation of general construction work to be responsible for and to maintain these items in position.

C. Unless otherwise noted elsewhere in Contract Documents, bear expense of cutting, patching, repairing or replacing of work of other trades made necessary by any fault, error or tardiness on part of Electrical Contract or damage done by Electric Contract. Employ and pay Contractor whose work is involved.

D. Roof Penetrations: Contractor is to employ and pay factory authorized roofing Contractor to perform all roof penetrations so to maintain existing factory roof warranties. Coordinate with Owner’s representative.

3.2 DEMONSTRATION OF COMPLETE ELECTRICAL SYSTEMS

A. Thoroughly demonstrate and instruct Owner's designated representative in care and operation of electrical systems and equipment furnished and installed in Electric Contract.

   1. System Operator: Maintain competent operator at building for at least 2 days in 2 consecutive weeks after Owner takes occupancy of major parts of building to operate systems and equipment in presence of Owner's representative.

   2. Factory Representative: In addition to demonstration and instruction specified above, provide technically qualified factory representatives from manufacturers of major

equipment to train Owner's representatives in care and operation of applicable products as specified in applicable technical sections of Division 26.

3. Coordinate and schedule time and place of all training through the Architect at the Owner's convenience.

4. Submit letters attesting to satisfactory completion of instructions, including date of completion of instruction, names of persons in attendance, and signature of Owner's authorized representative.

5. Architect's representative must be present when Owner's representatives participate in instruction.

3.3 GROUTING

A. Mix and install grout for electrical equipment base bearing surfaces, other equipment base plates, and anchors.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placement of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases and provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout.

3.4 SEALANTS

A. Install sealants according to the requirements specified in Section 079200 "Joint Sealants."

3.5 FIRESTOPPING

A. Install firestopping according to the requirements specified in Section 078413 "Penetration Firestopping."

B. Applied Fireproofing:

1. Coordinate the installation of hangers, supports and accessories from the structural steel with the fireproofing installation. Install all hangers and supports prior to installation of fireproofing.

2. Repair or replace existing fireproofing removed as a part of Electrical Work installation.

a. Employ the services of an approved fireproofing contractor to repair or replace the fireproofing by patching any areas that have been removed or damaged due to the installation of work after the completion of the fireproofing.

C. Repaired or replacement fireproofing shall match the fireproofing adjacent to the repaired area. All warranties shall be maintained.

3.6 ACCESS DOORS

A. Install access doors according to the requirements specified in Section 083113 “Access Doors and Frames.”

END OF SECTION 260500

SECTION 260501 – HAZARDOUS MATERIAL DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section and to all of Divisions 26.

1.2 SUMMARY

A. Section Includes:

1. Selective removal and subsequent off-site disposal of the following hazardous waste:

   a. PCB containing light ballasts.
   b. Mercury containing fluorescent light tubes.

2. Quality assurance requirements including personnel training and certification.

3. Requirements for transport and disposal of hazardous waste materials by legal and appropriate means.

1.3 REFERENCES

A. Regulatory Requirements

1. United States Environmental Protection Agency (EPA)

   a. 40 CFR 260 - Hazardous waste management system: General
   b. 40 CFR 261 - Identification and Listing of Hazardous Waste.
   c. 40 CFR 262 - Standards Applicable to Generators of Hazardous Waste.
   d. 40 CFR 263 - Standards Applicable to Transporters of Hazardous Waste
   e. 40 CFR 264 - Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
   f. 40 CFR 265 - Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities
   g. 40 CFR 266 - Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities
   h. 40 CFR 268 - Land Disposal Restrictions
   i. 40 CFR 270 - EPA Administered Permit Programs: The Hazardous Waste Permit Program
   j. 40 CFR 761 - Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution In Commerce, and Use Prohibitions.

2. United States Department of Transportation (DOT)

a. 49 CFR 171 - General Information, Regulations, and Definitions.
b. 49 CFR 172 - Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements.
c. 49 CFR 173 - Shippers - General Requirements for Shipments and Packaging.
d. 49 CFR 174 - Carriage by Rail.
e. 49 CFR 175 - Carriage by Aircraft.
f. 49 CFR 176 - Carriage by Vessel.
g. 49 CFR 177 - Carriage by Public Highway.
h. 49 CFR 178 - Specifications for Packaging.
i. 49 CFR 179 - Specifications for Tank Cars.
j. 49 CFR 180 - Continuing Qualification for Maintenance of Packaging.

3. New York State Department of Environmental Conservation (DEC)

a. 6 NYCRR 360 - Solid Waste Management Facilities
b. 6 NYCRR 364 - Waste Transporter Permits
c. 6 NYCRR 370 - Hazardous Waste Management System: General.
d. 6 NYCRR 371 - Identification and Listing of Hazardous Wastes.
e. 6 NYCRR 372 - Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities.
f. 6 NYCRR 373-1 - Hazardous Waste Treatment, Storage and Disposal Facility Permitting Requirements.
g. 6 NYCRR 373-2 - Final Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities.
h. 6 NYCRR 373-3 - Interim Status Standards for Owners and Operators of Hazardous Waster Facilities.
i. 6 NYCRR 376 - Land Disposal Restrictions.

1.4 HAZARDOUS WASTE GENERATOR STATUS

A. Owner is a Small Quantity Generator as defined by 6 NYCRR 371 and 40 CFR 26. Schedule removal, on-site storage, and transport as required to maintain Owner's status as a Small Quantity Generator.

1.5 DEFINITIONS

A. Remove: Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain Owner's property.

1.6 SUBMITTALS

A. Comply with requirements of SECTION 01 33 00 – Submittal Procedures and as modified below.

B. Proposed Schedule: Submit schedule indicating proposed sequence of operations for removal and disposal to Owner's Representative for review prior to start of removal operations. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control protection.

1. Provide detailed sequence of removals to ensure uninterrupted progress of Owner's on-site operations, including starting and ending dates for each activity.
2. Coordinate with Owner's continuing occupation of portions of existing building and with Owner's partial occupancy of completed new addition or structure, as applicable.
3. Include details for use of elevator and stairs and locations of temporary partitions and means of egress.

C. Photographs or Videotapes: Obtain photographs or videotape recordings of existing conditions of structure surfaces and equipment to remain and adjacent structures and site improvements that might be misconstrued as damage related to removal operations. Submit photographs or videotapes to Owner's Representative prior to start of Work.

D. Transport and Disposal Data

1. Prior to removal, transport or disposal, submit copies of:

a. Valid Waste Transporter Permit, issued by New York State Department of Environmental Conservation.

b. Written communication from designated treatment, storage or disposal facility that it:

1) Is authorized to receive and dispose of waste products generated by this Project.

2) Has capacity to receive and dispose of waste products generated by this project.

3) Will provide or assure that ultimate disposal method indicated on manifest for particular hazardous waste(s) will be followed.

c. Instruction regarding requirements for distribution of waste manifest as completed at time of shipment.

2. Post Disposal Submittals

a. Completely executed waste manifest.

b. Documentation of Hazardous Waste Determination, consisting of:

1) Test results.
2) Waste analyses or
3) Other hazardous waste determination information.

c. Landfill Records: Submit landfill records indicating receipt and acceptance of hazardous waste(s) by landfill facility licensed to accept hazardous waste(s).

E. Quality Control Submittals

1. Qualifications Certification: Submit written certification or similar documentation signed by applicable subcontractor, Contractor and manufacturer (where applicable) indicating compliance with applicable “Qualifications” requirements specified below in “Quality Assurance” article.

1.7 QUALITY ASSURANCE

A. Qualifications

1. Hazardous Material Disposal Subcontractor: Engage experienced firm that has successfully completed hazardous material disposal similar to that indicated for this Project and provides training as required by USEPA, USDOT, NYSDEC and OSHA.

B. Pre-Disposal Conference - Prior to beginning hazardous material disposal, conduct conference at Site to review requirements and conditions for hazardous material disposal with attendance by at least the following:

1. Contractor's representative.
2. Hazardous material disposal subcontractor representative, if applicable.
3. Owner's representative.
4. Architect’s representative.

1.8 PROJECT SITE

A. Existing Conditions

1. Building Occupancy: Owner will occupy portions of building immediately adjacent to areas of hazardous material removal operations. Conduct removal operations in manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of removal activities that will affect Owner's normal operations.

2. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during hazardous material removal operations.

a. Do not interrupt utilities service occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.

b. Maintain fire protection services during removal operations.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. Labeling and Packaging Materials: Provide labeling and packaging materials as required by 49 CFR 173 Shippers - General Requirements for Shipments and Packaging.

B. Hazardous Waste Disposal Vehicles: Provide vehicles for transporting hazardous waste possessing valid Industrial Waste Hauler Permit and equipped with appropriate placards affixed as prescribed by United States Department of Transportation regulations.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions (by Hazardous Material Disposal subcontractor): Examine conditions under which hazardous material disposal is to be conducted in coordination with Hazardous Materials Disposal Installer and notify affected Contractors and Architect in writing of any conditions detrimental to proper and timely hazardous material disposal. Do not proceed with disposal until unsatisfactory conditions have been corrected in manner acceptable to Hazardous Material Disposal Installer.

1. When Hazardous Material Disposal Installer confirms conditions as acceptable to ensure proper and timely installation and to ensure requirements for applicable warranty or guarantee can be satisfied, submit to Architect written confirmation from applicable Installer. Failure to submit written confirmation and subsequent installation will be assumed to indicate conditions are acceptable to Hazardous Material Disposal Installer.
2. Survey existing conditions and coordinate with hazardous material disposal requirements indicated to determine extent of hazardous material disposal required.
3. Inventory and record condition of items to be removed and reinstalled and items to be removed and salvaged.
4. Survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during hazardous material disposal operations.

B. Perform additional surveys as hazardous material disposal progresses to detect hazards resulting from hazardous material disposal activities.

3.2 REMOVAL, PACKAGING, TRANSPORTATION AND DISPOSAL PROCEDURES

A. Removal: Remove light ballasts and fluorescent light tubes whole and intact. Do not release PCBs or mercury to the environment.

B. Packaging: Package, label, and mark all hazardous waste materials in accordance with applicable requirements of 49 CFR 173, 178 and 179.

C. Temporary On-Site Storage and Protection: Provide storage on site of hazardous materials removed from service and scheduled for disposal to prevent damage or vandalism.

D. Temporary On-Site Storage and Protection: Provide storage on site of hazardous materials removed from service and scheduled for disposal complying with requirements of 6 NYCRR 372.2 (a) (8). Do not exceed 180 days storage on site.

E. Hazardous Waste Determination: Provide analysis required by Treatment, Storage or Disposal facility to document hazardous waste determination.

F. Hazardous Waste Manifests

1. Maintain manifest from date of transport until date of disposal, destruction or recycling.
2. Return fully executed manifests to Owner within 60 days of date waste accepted by initial transporter.
3. Use following type of manifest as applicable:

a. If waste is to be disposed of in New York State or if waste is to be disposed of in state not requiring use of specific manifest form, use New York State Uniform Hazardous Waste Manifest.

b. If the waste is to be disposed of in state other than New York State and that state requires use of specific manifest form, use manifest required by state where waste is to be disposed in lieu of New York State Uniform Hazardous Waste Manifest.

4. Complete manifest and deliver to Owner for review and signature.

5. Retain copies of manifest required to remain with hazardous waste shipment and deliver remaining copies to Owner.

6. Advise Owner regarding required distribution of manifest, both verbally and in writing.

G. Disposal - Transport hazardous waste to treatment or disposal facility that:

1. Is permitted, licensed or registered by state to dispose of hazardous waste.

2. Has interim status to dispose of hazardous waste.

3. Is authorized to manage hazardous waste under Resource Conservation and Recovery Act (RCRA) or

4. Is facility which:

a. Beneficially uses or reuses, or legitimately recycles or reclaims its waste; or

b. Treats its waste prior to beneficial use or reuse, or legitimate recycling or reclamation.

3.3 ADJUSTING/CLEANING

A. At least weekly, remove from building site debris, rubbish, and other materials resulting from hazardous material disposal operations.

1. If additional hazardous materials are encountered during hazardous material disposal operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

2. Burning of removed materials not permitted on Project Site.

3. Transport materials removed and legally dispose off-site.

B. Sweep building broom clean at end of each workday and on completion of hazardous material removal operations.

C. Upon completion of hazardous material removal, remove tools, equipment, and demolished materials from Site. Remove protections and leave interior areas broom clean. Change filters on air-handling equipment to remain.

END OF SECTION 26 05 01

SECTION 260513 - MEDIUM-VOLTAGE CABLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cables and related cable splices, terminations, and accessories for medium-voltage (2001 to 35,000 V) electrical distribution systems.

1.3 DEFINITIONS

A. Jacket: A continuous nonmetallic outer covering for conductors or cables.

B. NETA ATS: Acceptance Testing Specification.

C. Sheath: A continuous metallic covering for conductors or cables.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of cable. Include splices and terminations for cables and cable accessories.

1.5 QUALITY ASSURANCE

A. Installer: Engage a cable splicer, trained and certified by splice material manufacturer, to install, splice, and terminate medium-voltage cable.

B. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.6 FIELD CONDITIONS

A. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Construction Manager no fewer than seven (7) days in advance of proposed interruption of electric service.

2. Do not proceed with interruption of electric service without Construction Manager's written permission.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cables:

a. Aetna Insulated Wire, Inc.; a Berkshire Hathaway company.
b. General Cable Technologies Corporation.
c. Kerite; a Marmon Wire & Cable/Berkshire Hathaway company.
d. Okonite Company (The).
e. Prysmian Cables & Systems.
f. Southwire Company.

2. Cable Splicing and Terminating Products and Accessories:

a. Adalet; a Scott Fetzer company.
b. Engineered Products Company.
c. G&W Electric Company.
d. MP Husky.
e. RTE Components; Cooper Power Systems, Inc.
f. Thomas & Betts Corporation.
g. Thomas & Betts Corporation/Elastimold.
h. 3M; Electrical Markets Division.
i. Tyco Electronics; Raychem Products.

B. Source Limitations: Obtain cables and accessories from single source from single manufacturer.

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with IEEE C2 and NFPA 70.

2.3 CABLES

A. Cable Type: Type MV 105. Single shielded copper conductors.

B. Comply with UL 1072, AEIC CS8, ICEA S-93-639/NEMA WC 74, and ICEA S-97-682, and ICEA S-94-649.

C. Conductor: Copper.

D. Conductor Stranding: Compact round, concentric lay, Class B.

E. Neutrals: Shielded copper tape type.

F. Strand Filling: Conductor interstices are filled with impermeable compound.

G. Conductor Insulation: Ethylene-propylene rubber (EPR).

1. Voltage Rating: 15 kV.

2. Insulation Thickness: 133 percent insulation level.

H. Shielding: Solid copper wires, helically applied over semiconducting insulation shield.

I. Shielding and Jacket: Corrugated copper drain wires embedded in extruded, chlorinated, polyethylene jacket.

1. Circuit Identification: Color-coded tape (black, red, blue) under the metallic shielding.

2.4 CONNECTORS

A. Comply with ANSI C119.4 for connectors between aluminum conductors or for connections between aluminum to copper conductors.

B. Copper-Conductor Connectors: Copper barrel crimped connectors.

2.5 SOLID TERMINATIONS

1. Heat-shrink sheath seal kit with phase- and ground-conductor rejacketing tubes, cable-end sealing boot, and sealing plugs for unused ground-wire openings in boot.

B. Shielded-Cable Terminations: Comply with the following classes of IEEE 48. Insulation class shall be equivalent to that of cable. Include shield ground strap for shielded cable terminations.

1. Class 1 Terminations: Modular type, furnished as a kit, with stress-relief tube; multiple, molded-silicone-rubber, insulator modules; shield ground strap; and compression-type connector.

2. Class 1 Terminations: Heat-shrink type with heat-shrink inner stress control and outer non-tracking tubes; multiple, molded, non-tracking skirt modules; and compression-type connector.

3. Class 1 Terminations: Modular type, furnished as a kit, with stress-relief shield terminator; multiple-wet-process, porcelain, insulator modules; shield ground strap; and compression-type connector.

4. Class 1 Terminations, Indoors: Kit with stress-relief tube, non-tracking insulator tube, shield ground strap, compression-type connector, and end seal.

5. Class 2 Terminations, Indoors: Kit with stress-relief tube, non-tracking insulator tube, shield ground strap, and compression-type connector. Include silicone-rubber tape; cold-shrink-rubber sleeve; or heat-shrink, plastic-sleeve moisture seal for end of insulation whether or not supplied with kits.

6. Class 3 Terminations: Kit with stress cone and compression-type connector.

2.6 SEPARABLE INSULATED CONNECTORS

A. Description: Modular system, complying with IEEE 386, with disconnecting, single-pole, cable terminators and with matching, stationary, plug-in, dead-front terminals designed for cable voltage and for sealing against moisture.

B. Terminations at Distribution Points: Modular type, consisting of terminators installed on cables and modular, dead-front, terminal junctions for interconnecting cables.

C. Load-Break Cable Terminators: Elbow-type units with 200-A-load make/break and continuous-current rating; coordinated with insulation diameter, conductor size, and material of cable being terminated. Include test point on terminator body that is capacitance coupled.

D. Dead-Break Cable Terminators: Elbow-type unit with 600-A continuous-current rating; designed for de-energized disconnecting and connecting; coordinated with insulation diameter, conductor size, and material of cable being terminated. Include test point on terminator body that is capacitance coupled.

E. Dead-Front Terminal Junctions: Modular bracket-mounted groups of dead-front stationary terminals that mate and match with above cable terminators. Two-, three-, or four-terminal units as indicated, with fully rated, insulated, watertight conductor connection between terminals and complete with grounding lug, manufacturer's standard accessory stands, stainless-steel mounting brackets, and attaching hardware.

   1. Protective Cap: Insulating, electrostatic-shielding, water-sealing cap with drain wire.
   2. Portable Feed-Through Accessory: Two-terminal, dead-front junction arranged for removable mounting on accessory stand of stationary terminal junction.
   3. Grounding Kit: Jumpered elbows, portable feed-through accessory units, protective caps, test rods suitable for concurrently grounding three phases of feeders and carrying case.
   4. Standoff Insulator: Portable, single dead-front terminal for removable mounting on accessory stand of stationary terminal junction. Insulators suitable for fully insulated isolation of energized cable-elbow terminator.

F. Test-Point Fault Indicators: Applicable current-trip ratings and arranged for installation in test points of load-break separable connectors, and complete with self-resetting indicators capable of being installed with shotgun hot stick and tested with test tool.

G. Tool Set: Shotgun hot stick with energized terminal indicator, fault-indicator test tool, and carrying case.

2.7 SPLICE KITS

A. Splice Kits: Comply with IEEE 404; type as recommended by cable or splicing kit manufacturer for the application.

B. Splicing Products: As recommended, in writing, by splicing kit manufacturer for specific sizes, materials, ratings, and configurations of cable conductors. Include all components required for complete splice, with detailed instructions.

1. Combination tape and cold-shrink-rubber sleeve kit with rejacketing by cast-epoxy-resin encasement or other waterproof, abrasion-resistant material.
2. Heat-shrink splicing kit of uniform, cross-section, polymeric construction with outer heat-shrink jacket.
3. Premolded, cold-shrink-rubber, in-line splicing kit.
4. Premolded, EPDM splicing body kit with cable joint sealed by interference fit of mating parts and cable.
5. Separable multiway splice system with all components for the required splice configuration.

2.8 MEDIUM-VOLTAGE TAPES

A. Ethylene/propylene rubber-based, 30-mil splicing tape, rated for 130 deg C operation. Minimum 3/4 inch wide.

B. Silicone rubber-based, 12-mil self-fusing tape, rated for 130 deg C operation. Minimum 1-1/2 inches (38 mm) wide.

C. Insulating-putty, 125-mil elastic filler tape. Minimum 1-1/2 inches wide.

2.9 ARC-PROOFING MATERIALS

A. Tape for First Course on Metal Objects: 10-mil- thick, corrosion-protective, moisture-resistant, PVC pipe-wrapping tape.

B. Arc-Proofing Tape: Fireproof tape, flexible, conformable, intumescent to 0.3 inch thick, and compatible with cable jacket.

C. Glass-Cloth Tape: Pressure-sensitive adhesive type, 1 inch wide.

2.10 FAULT INDICATORS

A. Indicators: Automatically reset fault indicator with inrush restraint feature, arranged to clamp to cable sheath and provide a display after a fault has occurred in cable. Instrument shall not be affected by heat, moisture, and corrosive conditions and shall be recommended by manufacturer for installation conditions.

B. Resetting Tool: Designed for use with fault indicators, with moisture-resistant storage and carrying case.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cables according to IEEE 576.

B. Proof conduits prior to conductor installation by passing a wire brush mandrel and then a rubber duct swab through the conduit. Separate the wire brush and the rubber swab by 48 to 72 inches on the pull rope.

1. Wire Brush Mandrel: Consists of a length of brush approximately the size of the conduit inner diameter with stiff steel bristles and an eye on each end for attaching the pull ropes. If an obstruction is felt, pull the brush back and forth repeatedly to break up the obstruction.

2. Rubber Duct Swab: Consists of a series of rubber discs approximately the size of the conduit inner diameter on a length of steel cable with an eye on each end for attaching the pull ropes. Pull the rubber duct swab through the duct to extract loose debris from the duct.

C. Pull Conductors: Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

1. Where necessary, use manufacturer-approved pulling compound or lubricant that does not deteriorate conductor or insulation.

2. Use pulling means, including fish tape, cable, rope, and basket-weave cable grips, that do not damage cables and raceways. Do not use rope hitches for pulling attachment to cable.

3. Use pull-in guides, cable feeders, and draw-in protectors as required to protect cables during installation.

4. Do not pull cables with ends unsealed. Seal cable ends with rubber tape.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."

F. Install direct-buried cables on leveled and tamped bed of 3-inch- thick, clean sand. Separate cables crossing other cables or piping by a minimum of 2 inches of tamped earth, plus an additional 2 inches of sand. Install permanent markers at ends of cable runs, changes in direction, and buried splices.

G. Install "buried-cable" warning tape 12 inches above cables.

H. In manholes, handholes, pull boxes, junction boxes, and cable vaults, train cables around walls by the longest route from entry to exit; support cables at intervals adequate to prevent sag.

I. Install sufficient cable length to remove cable ends under pulling grips. Remove length of conductor damaged during pulling.

J. Install cable splices at pull points and elsewhere as indicated; use standard kits. Use dead-front separable watertight connectors in manholes and other locations subject to water infiltration.

K. Install terminations at ends of conductors, and seal multiconductor cable ends with standard kits.

L. Install separable insulated-connector components as follows:

1. Protective Cap: At each terminal junction, with one on each terminal to which no feeder is indicated to be connected.
2. Portable Feed-Through Accessory: At each terminal junction, with one on each terminal.
3. Standoff Insulator: At each terminal junction, with one on each terminal.

M. Arc Proofing: Unless otherwise indicated, arc proof medium-voltage cable at locations not protected by conduit, cable tray, direct burial, or termination materials. In addition to arc-proofing tape manufacturer's written instructions, apply arc proofing as follows:

1. Clean cable sheath.
2. Wrap metallic cable components with 10-mil pipe-wrapping tape.
3. Smooth surface contours with electrical insulation putty.
4. Apply arc-proofing tape in one half-lapped layer with coated side toward cable.
5. Band arc-proofing tape with two layers of 1-inch wide half-lapped, adhesive, glass-cloth tape at each end of the arc-proof tape.

N. Seal around cables passing through fire-rated elements according to Section 078413 "Penetration Firestopping."

O. Install fault indicators on each phase where indicated.

P. Ground shields of shielded cable at terminations, splices, and separable insulated connectors. Ground metal bodies of terminators, splices, cable and separable insulated-connector fittings, and hardware.

Q. Ground shields of shielded cable at one point only. Maintain shield continuity and connections to metal connection hardware at all connection points.

R. Identify cables according to Division 26 Section "Identification for Electrical Systems." Identify phase and circuit number of each conductor at each splice, termination, pull point, and junction box. Arrange identification so that it is unnecessary to move the cable or conductor to read the identification.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections.

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters.

2. After installing medium-voltage cables and before electrical circuitry has been energized, test for compliance with requirements.

3. Perform direct-current High Potential test of each new conductor according to NETA ATS, Ch. 7.3.3. Do not exceed cable manufacturer's recommended maximum test voltage.

4. Perform Partial Discharge test of each new conductor according to NETA ATS, Ch. 7.3.3 and to test equipment manufacturer's recommendations.

5. Perform Dissipation Factor test of each new conductor according to NETA ATS, Ch. 7.3.3 and to test equipment manufacturer's recommendations.

C. Medium-voltage cables will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 26 05 13

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Copper building wire.
2. Metal-clad cable, Type MC.
3. Fire-alarm wire and cable.
4. Connectors and splices.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

PART 2 - PRODUCTS

2.1 COPPER BUILDING WIRE

A. Description: Flexible, insulated and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

2. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

E. Conductor Insulation:
1. [Type RHH] [and] [Type RHW-2]. Comply with UL 44.
2. [Type USE-2] [and] [Type SE]. Comply with UL 854.
3. [Type THHN] [and] [Type THWN-2]. Comply with UL 83.
4. [Type THW] [and] [Type THW-2]. Comply with NEMA WC-70/ICEA S-95-658 and UL 83.
5. Type XHHW-2. Comply with UL 44.

2.2 METAL-CLAD CABLE, TYPE MC

A. Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

C. Standards:

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
2. Comply with UL 1569.
3. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

D. Circuits:

1. Single circuit with color-coded conductors.
2. Power-Limited Fire-Alarm Circuits: Comply with UL 1424.

E. Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors. Ground Conductor: Insulated.

F. Conductor Insulation:

1. Type TFN/THHN/THWN-2. Comply with UL 83.
2. Type XHHW-2. Comply with UL 44.

G. Armor: Steel, interlocked.

H. Jacket: PVC applied over armor.

2.3 FIRE-ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 16 AWG

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire-alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600 V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.

1. Low-Voltage Circuits: No. 16 AWG, minimum, in pathway.
2. Line-Voltage Circuits: No. 12 AWG, minimum, in pathway.
3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, NTRL listed for fire-alarm and cable tray installation, plenum rated.

2.4 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.

3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.
6. Ideal Industries/Buchanan

C. Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

D. Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

1. Material: Copper.
2. Type: Two hole with long barrels.
3. Termination: Compression.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders:

1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
2. Copper for feeders smaller than No. 4 AWG; copper or aluminum for feeders No. 4 AWG and larger. Conductors must be solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits:

1. Copper:

a. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

C. Power-Limited Fire Alarm and Control: Solid for No. 12 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type XHHW-2, single conductors in raceway.

B. Exposed Feeders: Type THHN/THWN-2, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN/THWN-2, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway, Metal-clad cable, Type MC.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type XHHW-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533.13 "Conduits for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

3.4 METAL—CLAD CABLE (MC)

A. May be used for branch circuits, where concealed above ceilings, in walls, and partitions. Use for homerun circuits originating at panels, out to first junction box or device, is not allowed.

B. May be used for 20 Amp circuits; from first junction box or device out to lighting fixtures, lighting control devices, receptacles. Rigid raceway from the electrical panelboard shall be provided to a junction box located above the ceiling in the area that the branch circuit serves.

C. Not permitted where inside of Electrical Closets, Mechanical Rooms, or IT / Telecommunication Closets.

D. Provide full-sized, individual insulated copper equipment grounding conductor for each circuit. Ganging of multiple

E. To have threaded steel insulated bushings and throats.

F. Provide clamp-type cable fittings with malleable iron locknuts and insulated throat bushing.

3.5 INSTALLATION OF FIRE-ALARM WIRE AND CABLE

A. Comply with NFPA 72.

B. Wiring Method: Install wiring in metal pathway according to Section 280528 "Pathways for Electronic Safety and Security."

1. Install plenum cable in environmental airspaces, including plenum ceilings.
2. Fire-alarm circuits and equipment control wiring associated with fire-alarm system must be installed in a dedicated pathway system.

    a. Cables and pathways used for fire-alarm circuits, and equipment control wiring associated with fire-alarm system, may not contain any other wire or cable.

3. Fire-Rated Cables: Use of two-hour, fire-rated fire-alarm cables, NFPA 70, Types MI and CI, is not permitted.
4. Signaling Line Circuits: Power-limited fire-alarm cables must not be installed in the same cable or pathway as signaling line circuits.

C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with fire-alarm system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

E. Color-Coding: Color-code fire-alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire-alarm system junction boxes and covers red.

F. Risers: Install at least two vertical cable risers to serve the fire-alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent receipt or transmission of signals from other floors or zones.

G. Wiring to Remote Alarm Transmitting Device: 1 inch conduit between the fire-alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.6 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than un-spliced conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 8-inches of slack.

D. Comply with requirements in Section 284621.11 "Addressable Fire-Alarm Systems for connecting, terminating, and identifying wires and cables.

3.7 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor and identify as spare conductor.

3.8 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.9 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

END OF SECTION 260519

SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backboards.
2. Category 6A balanced twisted pair cable.
3. Balanced twisted pair cable hardware.
4. Twin-axial data highway cable.
5. RS-232 cable.
6. RS-485 cable.
7. Control cable.
8. Control-circuit conductors.
9. Fire-alarm wire and cable.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alcan Products Corporation; Alcan Cable Division.
2. American Insulated Wire Corp.; a Leviton Company.
3. General Cable Corporation.
4. Senator Wire & Cable Company.
5. Southwire Company.

C. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262, by a qualified testing agency. Identify products for installation in plenums with appropriate markings from the applicable testing agency.

1. Flame Travel Distance: 60 inch or less.
2. Peak Optical Smoke Density: 0.5 or less.
3. Average Optical Smoke Density: 0.15 or less.

D. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.

E. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.

2.2 BACKBOARDS

A. Description: Plywood, fire-retardant treated, 3/4 by 48 by 96 inch. Comply with requirements for plywood backing panels in Section 061000 "Rough Carpentry."

B. Painting: Paint plywood on all sides and edges with flat gray alkyd paint. Comply with requirements in Section 099123 "Interior Painting."

2.3 CATEGORY 6A BALANCED TWISTED PAIR CABLE

A. Description: Four-pair, balanced-twisted pair cable, certified to meet transmission characteristics of Category 6A cable at frequencies up to 100 MHz.

B. Standard: Comply with ICEA S-90-661, NEMA WC 63.1, and TIA-568-C.2 for Category 6A cables.

C. Shielding/Screening: Unshielded twisted pairs (UTP), Shielded twisted pairs (FTP).

D. Cable Rating: Plenum rated.

E. Jacket: White thermoplastic.

2.4 BALANCED TWISTED PAIR CABLE HARDWARE

A. Description: Hardware designed to connect, splice, and terminate balanced twisted pair copper communications cable.

B. General Requirements for Balanced Twisted Pair Cable Hardware:

1. Comply with the performance requirements of Category 6a.
2. Comply with TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools.
3. Cables must be terminated with connecting hardware of same category or higher.

C. Source Limitations: Obtain balanced twisted pair cable hardware from single source from single manufacturer.

D. Connecting Blocks: 110-style IDC for Category 6A. Provide blocks for the number of cables terminated on the block, plus 25 percent spare, integral with connector bodies, including plugs and jacks where indicated.

E. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.

F. Patch Panel: Modular panels housing numbered jack units with IDC-type connectors at each jack location for permanent termination of pair groups of installed cables.

1. Features:

a. Universal T568A and T568B wiring labels.
b. Labeling areas adjacent to conductors.
c. Replaceable connectors.
d. 24 or 48 ports.

2. Construction: 16-gauge steel and mountable on 19 inch equipment racks.
3. Number of Jacks per Field: One for each four-pair cable indicated, plus spares and blank positions adequate to suit specified expansion criteria.

G. Patch Cords: Factory-made, four-pair cables in 48 inch lengths; terminated with an eight-position modular plug at each end.

1. Patch cords must have bend-relief-compliant boots and color-coded icons to ensure performance. Patch cords must have latch guards to protect against snagging.
2. Patch cords must have color-coded boots for circuit identification.

H. Plugs and Plug Assemblies:

1. Male; eight position; color-coded modular telecommunications connector designed for termination of a single four-pair 100 ohm unshielded or shielded balanced twisted pair cable.
2. Comply with IEC 60603-7-1, IEC 60603-7-2, IEC 60603-7-3, IEC 60603-7-4, and IEC 60603-7.5.
3. Marked to indicate transmission performance.

I. Jacks and Jack Assemblies:

1. Female; eight position; modular; fixed telecommunications connector designed for termination of a single four-pair 100 ohm unshielded or shielded balanced twisted pair cable.
2. Designed to snap-in to a patch panel or faceplate.
3. Standards.
a. Category 6a, unshielded balanced twisted pair cable must comply with IEC 60603-7-41.

b. Category 6a, shielded balanced twisted pair cable must comply with IEC 60603-7.51.

4. Marked to indicate transmission performance.

J. Faceplate:

1. Four port, vertical single gang faceplates designed to mount to single gang wall boxes.
2. Plastic Faceplate: High-impact plastic. Coordinate color with Section 262726 "Wiring Devices."
3. Metal Faceplate: Stainless steel, complying with requirements in Section 262726 "Wiring Devices."
4. For use with snap-in jacks accommodating any combination of balanced twisted pair, optical fiber, and coaxial work area cords.

a. Flush mounting jacks, positioning the cord at a 45-degree angle.

K. Legend:

1. Machine printed, in the field, using adhesive-tape label.
2. Snap-in, clear-label covers and machine-printed paper inserts.

2.5 TWIN-AXIAL DATA HIGHWAY CABLE

A. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, 8 pairs, No. 24 AWG, stranded (7x32) tinned-copper conductors.
2. Plastic insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. Plastic jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned-copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.6 RS-232 CABLE

A. PVC-Jacketed, TIA 232-F:

1. Nine, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Polypropylene insulation.
3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
4. PVC jacket.
5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. NFPA 70 Type: Type CM.
7. Flame Resistance: Comply with UL 1581.

B. Plenum-Type, TIA 232-F:

1. Nine, No. 22 AWG, stranded (7x30) tinned copper conductors.

2. PE insulation.
3. Aluminum foil-polyester tape shield with 100 percent shield coverage.
4. Fluorinated ethylene propylene jacket.
5. Conductors are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.7 RS-485 CABLE

A. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, two pairs, No. 22 AWG, stranded (7x30) tinned-copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262.

2.8 CONTROL CABLE

A. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. Multi-pair, twisted, No. 16 AWG, stranded (19x29) tinned-copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

2.9 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

B. Class 2 Control Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type THHN/THWN-2, complying with UL 83 in raceway.

D. Class 2 Control Circuits and Class 3 Remote-Control and Signal Circuits That Supply Critical Circuits: Circuit Integrity (CI) cable.

1. Smoke control signaling and control circuits.

2.10 FIRE-ALARM WIRE AND CABLE

A. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

B. Signaling Line Circuits: Twisted, shielded pair, No. 16 AWG.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire-alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a two-hour rating.

C. Non-Power-Limited Circuits: Solid-copper conductors with 600 V rated, 75 deg C, color-coded insulation, and complying with requirements in UL 2196 for a two-hour rating.

1. Control-Voltage Circuits: No. 16 AWG, minimum, in pathway.
2. Low-Voltage Circuits: No. 12 AWG, minimum, in pathway.
3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, NTRL listed for fire-alarm and cable tray installation, plenum rated.

2.11 SOURCE QUALITY CONTROL

A. Factory test balanced twisted pair cables according to TIA-568-C.2.

B. Cable will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Test cables on receipt at Project site.

1. Test each pair of twisted pair cable for open and short circuits.

3.2 INSTALLATION OF RACEWAYS AND BOXES

A. Comply with requirements in Section 260533.13 "Conduits for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.

B. Comply with requirements in Section 260533.23 "Surface Raceways for Electrical Systems" for raceway selection and installation requirements for wireways as supplemented or modified in this Section.

C. Comply with requirements in Section 260533.16 "Boxes and Covers for Electrical Systems" for raceway selection and installation requirements for boxes as supplemented or modified in this Section.

1. Outlet boxes must be no smaller than 2 inch wide, 3 inch high, and 2-1/2 inch deep.
2. Outlet boxes must be no smaller than 4 inch square by 1-1/2 inch deep with extension ring sized to bring edge of ring to within 1/8 inch of the finished wall surface.

3. Flexible metal conduit must not be used.

D. Comply with TIA-569-D for pull-box sizing and length of conduit and number of bends between pull points.

E. Install manufactured conduit sweeps and long-radius elbows if possible.

F. Raceway Installation in Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard if a single piece of plywood is installed, or in the corner of the room if multiple sheets of plywood are installed around perimeter walls of the room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard if entering the room from overhead.
4. Extend conduits 6 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

G. Backboards: Install backboards with 96 inch dimension vertical. Butt adjacent sheets tightly and form smooth gap-free corners and joints.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. General Requirements for Cabling:

1. Comply with TIA-568-C Series of standards.
2. Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems."
3. Terminate all conductors; cable must not contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced and must be continuous from terminal to terminal. Do not splice cable between termination, tap, or junction points.
5. Cables serving a common system may be grouped in a common raceway. Install network cabling and control wiring and cable in separate raceway from power wiring. Do not group conductors from different systems or different voltages.
6. Secure and support cables at intervals not exceeding 30 inch and not more than 6 inch from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Install lacing bars and distribution spools.
8. Do not install bruised, kinked, scored, deformed, or abraded cable. Remove and discard cable if damaged during installation and replace it with new cable.
9. Cold-Weather Installation: Bring cable to room temperature before dereeling. Do not use heat lamps for heating.
10. Pulling Cable: Comply with BICSI ITSIMM, Ch. 5, "Copper Structured Cabling Systems." Monitor cable pull tensions.
11. Support: Do not allow cables to lay on removable ceiling tiles.
12. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.
13. Provide strain relief.

14. Keep runs short. Allow extra length for connecting to terminals. Do not bend cables in a radius less than 10 times the cable OD. Use sleeves or grommets to protect cables from vibration at points where they pass around sharp corners and through penetrations.
15. Ground wire must be copper, and grounding methods must comply with IEEE C2. Demonstrate ground resistance.

C. Balanced Twisted Pair Cable Installation:

1. Comply with TIA-568-C.2.
2. Install termination hardware as specified in Section 271513 "Communications Copper Horizontal Cabling" unless otherwise indicated.
3. Do not untwist UTP cables more than 1/2 inch at the point of termination to maintain cable geometry.

D. Installation of Control-Circuit Conductors:

1. Install wiring in raceways.

E. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inch above ceilings by cable supports not more than 30 inch apart.
3. Cable must not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.

F. Installation of Cable Routed Exposed under Raised Floors:

1. Install plenum-rated cable only.
2. Install cabling after the flooring system has been installed in raised floor areas.
3. Below each feed point, neatly coil a minimum of 72 inches of cable in a coil not less than 12 inches in diameter.

3.4 REMOVAL OF CONDUCTORS AND CABLES

A. Remove all existing or new abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified with a tag for future use.

3.5 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits; No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.6 FIRESTOPPING

A. Comply with requirements in Section 078413 "Penetration Firestopping."

B. Comply with TIA-569-D, Annex A, "Firestopping."

C. Comply with BICSI TDMM, "Firestopping" Chapter.

3.7 GROUNDING

A. For data communication wiring, comply with TIA-607-B and with BICSI TDMM, "Bonding and Grounding (Earthing)" Chapter.

B. For control-voltage wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.8 IDENTIFICATION

A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Identify data and communications system components, wiring, and cabling according to TIA-606-B; label printers must use label stocks, laminating adhesives, and inks complying with UL 969.

C. Identify each wire on each end and at each terminal with a number-coded identification tag. Each wire must have a unique tag.

3.9 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Visually inspect cable jacket materials for UL or third-party certification markings. Inspect cabling terminations to confirm color-coding for pin assignments and inspect cabling connections to confirm compliance with TIA-568-C.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

B. End-to-end cabling will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 260523

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Grounding and bonding conductors.
2. Grounding and bonding clamps.
3. Grounding and bonding bushings.
4. Grounding and bonding hubs.
5. Grounding and bonding connectors.
6. Intersystem bonding bridge grounding connector.
7. Grounding and bonding busbars.
8. Signal reference grids.
9. Grounding (earthing) electrodes.

1.2 DEFINITIONS

A. BBC: Backbone bonding conductor, for connecting multiple TBBs serving the same floor.

B. PBB: Primary bonding busbar, located in main distribution frame room, ideally near electrical service entrance.

C. RBB: Rack bonding busbar, located in equipment cabinets and racks.

D. SBB: Secondary bonding busbar, located in intermediate distribution frame rooms.

E. TBB: Telecommunications bonding backbone, for connecting SBBs to PBB.

F. TBC: Telecommunications bonding conductor, for connecting PBB to intersystem bonding termination device or busbar at electrical service entrance.

G. TEBC: Telecommunications equipment bonding conductor, for connecting RBBs to SBBs or PBB.

H. UBC: Unit bonding conductor, for connecting individual communications equipment to RBBs or SBBs.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Grounding and bonding conductors.
2. Grounding and bonding clamps.
3. Grounding and bonding bushings.

4. Grounding and bonding hubs.
5. Grounding and bonding connectors.
6. Intersystem bonding bridge grounding connector.
7. Grounding and bonding busbars.
8. Signal reference grids.
9. Grounding (earthing) electrodes.

B. Shop Drawings: Plans showing dimensioned locations of grounding features described in "Field Quality Control for Grounding and Bonding of Electrical Power" Article, including the following:

1. Test wells.
2. Rod electrodes.
3. Ring electrodes.
4. Grounding arrangements and connections for separately derived systems.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. In addition to items specified in Section 260010 "Supplemental Requirements for Electrical," include the following:

a. Plans showing locations of grounding features described in "Field Quality Control for Grounding and Bonding of Electrical Power" Article, including the following:

1) Rod electrodes.

PART 2 - PRODUCTS

2.1 GROUNDING AND BONDING CONDUCTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Chance/Hubbell
2. Copperweld Corp.
3. Thomas & Betts, Electrical
4. Avendra, LLC`

B. Equipment Grounding Conductor:

1. General Characteristics: 600 V, THHN/THWN-2 or THWN-2, copper wire or cable, green color, in accordance with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. ASTM - Bare Copper Grounding and Bonding Conductor:

1. Referenced Standards: Complying with one or more of the following:

a. Soft or Annealed Copper Wire: ASTM B3.
b. Concentric-Lay Stranded Copper Conductor: ASTM B8.
c. Tin-Coated Soft or Annealed Copper Wire: ASTM B33.
d. 19-Wire Combination Unilay-Stranded Copper Conductor: ASTM B787/B787M.

2. Options:

a. Color: green.

2.2 GROUNDING AND BONDING CLAMPS

A. Description: Clamps suitable for attachment of grounding and bonding conductors to grounding electrodes, pipes, tubing, and rebar. Grounding and bonding clamps specified in this article are also suitable for use with communications applications.

B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

C. UL KDER and KDSH - U-Bolt-Type Pipe and Rod Grounding and Bonding Clamp:

1. General Characteristics:

a. Clamp Material: Tinned brass.
b. Listed for outdoor use.

D. UL KDER - Beam Grounding and Bonding Clamp:

1. General Characteristics: Mechanical-type, terminal, ground wire access from four directions; with dual, tin-plated or silicon bronze bolts.

E. UL KDER - Exothermically Welded Connection:

1. General Characteristics: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

2.3 GROUNDING AND BONDING BUSHINGS

A. Description: Bonding bushings connect conduit fittings, tubing fittings, threaded metal conduit, and unthreaded metal conduit to metal boxes and equipment enclosures and have one or more bonding screws intended to provide electrical continuity between bushing and enclosure.

Grounding bushings have provision for connection of bonding or grounding conductor and may or may not also have bonding screws.

B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

C. UL KDER - Bonding Bushing:

1. General Characteristics: Threaded bushing with insulated throat.

D. UL KDER - Grounding Bushing:

1. General Characteristics: Threaded bushing with insulated throat and mechanical-type wire terminal.

2.4 GROUNDING AND BONDING HUBS

A. Description: Hubs with certified grounding or bonding locknut.

B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

C. UL KDER - Grounding and Bonding Hub:

1. General Characteristics: Insulated, gasketed, watertight hub with mechanical-type wire terminal.

2.5 GROUNDING AND BONDING CONNECTORS

A. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.
b. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

B. UL KDER - Lay-In Lug Mechanical-Type Grounding and Bonding Busbar Terminal:

1. General Characteristics: Mechanical-type, copper rated for direct burial terminal with set screw.

C. UL KDER - Crimped Lug Pressure-Type Grounding and Bonding Busbar Terminal:

1. General Characteristics: Cast silicon bronze, solderless compression-type wire terminals; with long barrel and two holes spaced on 5/8 or 1 inch centers for two-bolt connection to busbar.

D. UL KDER - Split-Bolt Service-Post Pressure-Type Grounding and Bonding Busbar Terminal:

1. General Characteristics: Bolts that surround cable and bond to cable under compression when nut is tightened after assembly is screwed into busbar opening.

E. UL KDER - Crimped Pressure-Type Grounding and Bonding Cable Connector:

1. General Characteristics: Crimp-and-compress connectors that bond to conductor when connector is compressed around conductor.

a. Copper, Tinned copper, C and H shaped.

F. UL KDER - Split-Bolt Pressure-Type Grounding and Bonding Cable Connector:

1. General Characteristics: Bolts that surround cable and bond to cable under compression when nut is tightened.

a. Copper, Tinned copper.

2.6 INTERSYSTEM BONDING BRIDGE GROUNDING CONNECTORS

A. Description: Devices that provide means for connecting communications systems grounding and bonding conductors at service equipment or at disconnecting means for buildings or structures.

B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment for Communications: UL CCN KDSH; including UL 467.

2.7 GROUNDING AND BONDING BUSBARS

A. Description: Miscellaneous grounding and bonding device that serves as common connection for multiple grounding and bonding conductors.

B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

C. UL KDER - Equipment Room Grounding and Bonding Busbar:

1. General Characteristics:

a. Bus: Rectangular bar of annealed copper.
b. Mounting Stand-Off Insulators: Lexan or PVC.

1) Comply with UL 891 for use in 600 V switchboards, impulse tested at 5000 V.

2. Options:

a. Dimensions: 1/4 by 4 inch in cross section; length as indicated on Drawings.
b. Predrilled Hole Pattern: 9/32 inch holes spaced 1-1/8 inch apart, Suitable for installing specified grounding and bonding connectors.
c. Mounting Hardware: Stand-off brackets that provide 2-inch clearance to access rear of bus. Brackets and bolts must be stainless steel.

D. UL KDER - Rack and Cabinet Bonding Busbar:

1. General Characteristics:

a. Bus: Rectangular bar of hard-drawn solid copper.
b. Horizontal Mounting Dimensions: Designed for mounting in 19-inch-wide equipment racks or cabinets.
c. Vertical Mounting Dimensions: Designed for mounting in 72-inch-high equipment racks or cabinets.
d. Predrilled Hole Pattern: Accepts connectors for grounding and bonding conductor sizes 14 AWG to 2/0 AWG.
e. Mounting Hardware: Stainless steel or copper-plated, for attachment to rack.

2.8 GROUNDING (EARTHING) ELECTRODES

A. Description: Grounding electrodes include rod electrodes, ring electrodes, metal underground water pipes, metal building frames, concrete-encased electrodes, and pipe and plate electrodes.

B. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Listing Criteria:

a. Grounding and Bonding Equipment: UL CCN KDER; including UL 467.

C. UL KDER - Rod Electrode:

1. General Characteristics: Copper-clad; 3/4 inch by 10 ft.

PART 3 - EXECUTION

3.1 SELECTION OF GROUNDING AND BONDING PRODUCTS FOR ELECTRICAL POWER

A. Grounding and Bonding Conductors:

1. Provide solid conductor for 8 AWG and smaller, and stranded conductors for 6 AWG and larger, unless otherwise indicated.
2. Custom-Length Insulated Equipment Bonding Jumpers: 6 AWG, 19-strand, Type THHN.
3. Bonding Cable: 28 kcmil, 14 strands of 17 AWG conductor, 1/4 inch in diameter.
4. Bonding Conductor: 4 AWG or 6 AWG, stranded conductor.
5. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.
6. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inch wide and 1/16 inch thick.
7. Underground Grounding Conductors: Install bare tinned-copper conductor, 2/0 AWG minimum.

B. Grounding and Bonding Connectors:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

C. Grounding and Bonding Busbars: Provide in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

3.2 SELECTION OF GROUNDING AND BONDING PRODUCTS FOR COMMUNICATIONS

A. Grounding and Bonding Conductors:

1. Communications Busbar Connections:

a. TBC: Not smaller than 3/0 AWG and no smaller than largest TBB.
b. TBB: Not smaller than 2 kcmil per linear ft of conductor length, but not larger than 750 kcmil, unless otherwise indicated on Drawings.
c. BBC: Not smaller than largest TBB to which it is connected unless otherwise indicated on Drawings.
d. TEBC: Not smaller than 2 AWG unless otherwise indicated on Drawings. Provide bolted connectors.
e. UBC: Not smaller than 6 AWG unless otherwise indicated on Drawings. Provide bolted connectors.
f. Bonding Conductors to Structural Steel: Not smaller than 6 AWG unless otherwise indicated on Drawings. Provide bolted clamp connectors.

2. Cable Tray Connections:

a. Cable Tray Equipment Grounding Conductor: 6 AWG.
b. Cable Tray Bonding Jumper: If not supplied by cable manufacturer, provide bonding jumper not smaller than 6 AWG and not longer than 12 inch. If jumper is wire, it must be terminated with lug having two holes and long barrel for two crimps. If jumper is flexible braid, it must be terminated with one- or two-hole ferrule. Attach with bonding screw or connector provided by cable tray manufacturer.

3. Underground Connections: Not smaller than 2 AWG. Provide welded connectors, except bolted connectors may be used in handholes or manholes and as otherwise indicated on Drawings.

B. Grounding and Bonding Busbars:

1. PBB:

a. Dimensions: 1/4 inch thick by 4 inch high.
b. Stand-Off Distance: 2 inch.

2. SBB:

a. Dimensions: 1/4 inch thick by 4 inch high.
b. Stand-Off Distance: 2 inch.

3.3 INSTALLATION OF GROUNDING AND BONDING FOR ELECTRICAL POWER

A. Comply with manufacturer's published instructions.

B. Special Techniques:

1. Grounding and Bonding Conductors:

a. Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

b. Underground Grounding Conductors:

1) Bury at least 30 inch below grade.
2) Duct-Bank Grounding Conductor: Bury 12 inch above duct bank when indicated as part of duct-bank installation.

2. Grounding and Bonding Connectors: Make connections so the possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

a. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
b. Make connections with clean, bare metal at points of contact.
c. Make aluminum-to-steel connections with stainless steel separators and mechanical clamps.
d. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
e. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
f. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1) Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate adjacent parts.
2) Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
3) Use exothermic-welded connectors for outdoor locations; if disconnect-type connection is required, use bolted clamp.

g. Grounding and Bonding for Piping:

1) Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use bolted clamp connector or bolt lug-type connector to pipe flange by using one of lug bolts of flange. Where dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2) Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with bolted connector.
3) Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

h. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

i. Grounding for Steel Building Structure: Install driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 ft apart.

3. Grounding and Bonding Busbars:

   a. Install busbar horizontally, on insulated spacers 2 inch minimum from wall, 6 inch above finished floor unless otherwise indicated.
   b. Where busbars are indicated on both sides of doorways, route bonding conductor up to top of door frame, across top of doorway, and down; connect to continuation of horizontal busbar.

4. Electrodes:

   a. Ground Rods: Drive rods until tops are 2 inch below finished floor or final grade unless otherwise indicated.

      1) Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
      2) Use exothermic welds for below-grade connections.

   b. For grounding electrode system, install three ground rods spaced at least one-rod length from each other and located at least same distance from other grounding electrodes, and connect to service grounding electrode conductor.

5. Grounding at Service:

   a. Equipment grounding conductors and grounding electrode conductors must be connected to ground busbar. Install main bonding jumper between neutral and ground buses.

6. Grounding Separately Derived Systems:

   a. Generator: Install grounding electrode(s) at generator location. Electrode must be connected to equipment grounding conductor and to frame of generator.

7. Grounding Underground Distribution System Components:

   a. Duct-Bank Grounding Conductor: Bury 12 inch above duct bank when indicated as part of duct-bank installation.
   b. Comply with IEEE C2 grounding requirements.
   c. Grounding Manholes and Handholes: Install driven ground rod through manhole or handhole floor, close to wall, and set rod depth so 4 inch will extend above finished floor. If necessary, install ground rod before manhole is placed and provide 1/0 AWG bare, tinned-copper conductor from ground rod into manhole through waterproof sleeve in manhole wall. Protect ground rods passing through concrete floor with double wrapping of pressure-sensitive insulating tape or heat-shrunk insulating sleeve from 2 inch above to 6 inch below concrete. Seal floor opening with waterproof, non-shrink grout.
   d. Grounding Connections to Manhole Components: Bond exposed-metal parts such as inserts, cable racks, pulling irons, ladders, and cable shields within each

manhole or handhole, to ground rod or grounding conductor. Make connections with 4 AWG minimum, stranded, hard-drawn copper bonding conductor. Train conductors level or plumb around corners and fasten to manhole walls. Connect to cable armor and cable shields in accordance with manufacturer's published instructions with splicing and termination kits.

e. Pad-Mounted Transformers and Switches: Install two ground rods and ring electrode around pad. Ground pad-mounted equipment and noncurrent-carrying metal items associated with substations by connecting them to underground cable and grounding electrodes. Install tinned-copper conductor not less than 2 AWG for ring electrode and for taps to equipment grounding terminals. Bury ring electrode not less than 6 inch from foundation.

8. Equipment Grounding:

a. Install insulated equipment grounding conductors with feeders and branch circuits.
b. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

1) Feeders and branch circuits.
2) Lighting circuits.
3) Receptacle circuits.
4) Single-phase motor and appliance branch circuits.
5) Three-phase motor and appliance branch circuits.
6) Flexible raceway runs.
7) Armored and metal-clad cable runs.
8) Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.

c. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
d. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
e. Poles Supporting Outdoor Lighting Fixtures: Install grounding electrode and separate insulated equipment grounding conductor in addition to grounding conductor installed with branch-circuit conductors.
f. Metallic Fences: Comply with requirements of IEEE C2.

1) Grounding Conductor: Bare, tinned copper, not less than 6 AWG.
2) Gates: Must be bonded to grounding conductor with flexible bonding jumper.
3) Barbed Wire: Strands must be bonded to grounding conductor.

g. Grounding Method: At each grounding location, drive grounding rod vertically until top is 6 inch below finished grade. Connect rod to fence with 6 AWG conductor. Connect conductor to each fence component at grounding location.
h. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.

3.4 INSTALLATION OF BONDING FOR COMMUNICATIONS

A. Grounding of Communications: Bond PBB and SBBs to grounding electrode conductors at electrical power service entrance, and at electrical power derived systems serving communications equipment, using intersystem bonding termination device.

1. Structural Steel: Where structural steel of steel frame building is readily accessible within room or space, bond each SBB and PBB to vertical steel of building frame.

B. Comply with manufacturer's published instructions.

C. Reference Standards:

1. Bonding of Communications: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with BICSI N3.
2. Consult Architect for resolution of conflicting requirements.

D. Special Techniques:

1. Bonding of Busbars:

a. Indicate locations of grounding busbars on Drawings. Install busbars horizontally, on insulated spacers 12 inch above finished floor unless otherwise indicated.
b. Where busbars are indicated on both sides of doorways, route bonding conductor up to top of door frame, across top of doorway, and down; connect to continuation of horizontal busbar.

2. Bonding Conductors:

a. Stacking of conductors under a single bolt is not permitted when connecting to busbars.
b. Assemble wire connector to conductor, complying with manufacturer's published instructions and as follows:

1) Use crimping tool and die specific to connector.
2) Pretwist conductor.
3) Apply antioxidant compound to bolted and compression connections.

c. Install in straightest and shortest route between origination and termination point, and no longer than required. Bend radius must not be smaller than 10 times diameter of conductor. No single bend may exceed 90 degrees.
d. Install without splices.
e. Support conductors at not more than 36 inch intervals.
f. Outside telecommunications rooms, install conductors in metric designator 21 (trade size 3/4) PVC-80 conduit until conduit enters telecommunications room. Install bonding conductors in EMT-A or EMT-SS when routed through plenum. Do not install bonding conductors in EMT-S unless otherwise indicated on Drawings.

1) If bonding conductor must be installed in EMT-S or other ferrous metallic raceway, bond conductor to raceway using grounding bushing and bond both ends of raceway to SBB.

3. Provide TBC and terminate ends to PBB and intersystem bonding termination device, busbar at electrical service entrance in accordance with Section 250.94, "Bonding for Communication Systems," of NFPA 70.
4. Busbar Interconnections: Bond SBBs to PBB with TBBs. If more than one TBB is installed, bond TBBs together with BBCs where required by TIA-607.
5. Communications Enclosures: Bond metallic enclosures of telecommunications equipment with UBCs to nearest SBB or PBB.
6. Equipment Racks: Bond metallic components of enclosures to RBB using UBCs. Provide vertically mounted RBB if not provided by enclosure or rack manufacturer. Bond RBB to SBB with TEBC. Power connection must comply with NFPA 70; equipment grounding conductor in power cord of cord- and plug-connected equipment must be considered supplemental to bonding requirements in this Section.
7. Shielded Cable: Bond shield of shielded cable to SBB in communications rooms and spaces. Comply with TIA-568.1 and TIA-568.2 when grounding shielded balanced twisted-pair cables.
8. Primary Protector: Bond to PBB with insulated bonding conductor.
9. Electrical Power Panelboards: Where electrical panelboards for communications equipment are located in same room or space, bond each ground bar of panelboard to SBB.
10. Cable Trays: Provide continuous electrical path by installing bonding clips and jumpers. Bond each end to nearest SBB.
11. Ladder Racks: Provide continuous electrical path by installing bonding clips and jumpers. Bond each end to nearest SBB.
12. Access Floors: Bond metal parts of access floors to SBB.

E. Identification of Communications:

1. Labels must be preprinted or computer-printed type.

   a. Label PBB(s) with "ts-PBB," where "ts" is telecommunications space identifier for location of PBB.
   b. Label SBB(s) with "ts-SBB," where "ts" is telecommunications space identifier for location of SBB.
   c. Label TBC, TBBs, and BBCs at attachment points with legend: "WARNING! COMMUNICATIONS BONDING CONDUCTOR. DO NOT REMOVE OR DISCONNECT!"

3.5 INSTALLATION OF GROUNDING AND BONDING FOR TOWERS AND ANTENNAS

1. Special Requirements for Waveguides and Coaxial Cable:

   a. Bond cable shields at point of entry into building to nearest SBB and to cable entrance plate, using 2 AWG bonding conductors.
   b. Bond coaxial cable surge arrester to ring electrode or roof ring using bonding conductor size recommended by surge-arrester manufacturer.

3.6 FIELD QUALITY CONTROL FOR GROUNDING AND BONDING OF ELECTRICAL POWER

A. Acceptance Testing Preparation:

1. Field tests and inspections must be witnessed by Architect.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench in accordance with manufacturer's published instructions.
3. Test completed grounding system at each location where maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground and at individual ground rods. Make tests at ground rods before conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method in accordance with IEEE Std 81.
    c. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to record of tests and observations. Include number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Nonconforming Work:

1. Grounding system will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective components and retest.

D. Collect, assemble, and submit test and inspection reports.

1. Report measured ground resistances that exceed the following values:
    a. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 Ω.
    b. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 Ω.
    c. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 Ω.
    d. Substations and Pad-Mounted Equipment: 5 Ω.
    e. Manhole Grounds: 10 Ω.

3.7 FIELD QUALITY CONTROL FOR BONDING OF COMMUNICATIONS

A. Acceptance Testing Preparation:

B. Field tests and inspections must be witnessed by Campus Representative.

C. Tests and Inspections:

1. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with calibrated torque wrench according to manufacturer's published instructions.
2. Test bonding connections of system using AC earth ground-resistance tester, taking two-point bonding measurements in each telecommunications equipment room containing PBB or SBB, using process recommended by BICSI N1. Conduct tests with facility in operation.

    a. Measure resistance between PBB and electrical service intersystem termination point. Maximum acceptable value is 100 mΩ.

        1) If measured resistance from electrical service equipment to ground exceeds 5 Ω, notify Architect and include recommendations to reduce resistance to ground.

    b. Measure resistance between SBBs and PBB. Maximum acceptable value is 100 mΩ.

3. Test for ground loop currents using digital clamp-on ammeter, with full scale not more than 10 A, displaying current in increments of 0.01 A at accuracy of plus or minus 2.0 percent.

    a. With grounding infrastructure completed and communications system electronics operating, measure current in bonding conductors connected to PBB and to SBBs. Maximum acceptable AC current level is 1 A.

D. Nonconforming Work:

1. Communications bonding will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

E. Collect, assemble, and submit test and inspection reports.

3.8 PROTECTION

A. After installation, protect grounding and bonding cables and equipment from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Support, anchorage, and attachment components.
2. Fabricated metal equipment support assemblies.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Signed and sealed by a qualified professional engineer**.** For fabrication and

1. Hangers. Include product data for components.
2. Slotted support systems.
3. Equipment supports.
4. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include adjustable motor bases, rails, and frames for equipment mounting.

C. Delegated Design Submittals: For hangers and supports for electrical systems.

1. Include design calculations and details of hangers.
2. Include design calculations for seismic restraints.

1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Allied Tube & Conduit.
b. Cooper B-Line, Inc.; a division of Cooper Industries.
c. ERICO International Corporation.
d. GS Metals Corp.
e. Thomas & Betts Corporation.
f. Unistrut; Tyco International, Ltd.
g. Wesanco, Inc.

2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.

4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

5. U-Channel Strut Systems: Provide 16 gauge steel U-channel strut system for supporting electrical equipment of types and sizes indicated with 9/16-inch diameter holes at 8 inches on center on top surface, with standard galvanized or PVC finish and following fittings that mate and match with U-channel:

a. Fixture hangers.
b. Channel hangers
c. End caps
d. Beam clamps
e. Wiring stud.
f. Thin-wall raceway clamps.
g. Rigid conduit clamps.
h. Raceway hangers.
i. U-bolts.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel and malleable-iron hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) Hilti Inc.
        2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        3) MKT Fastening, LLC.
        4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.

2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

    a. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

        1) Cooper B-Line, Inc.; a division of Cooper Industries.
        2) Empire Tool and Manufacturing Co., Inc.
        3) Hilti Inc.
        4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
        5) MKT Fastening, LLC.

3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.

5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.

6. Toggle Bolts: All-steel springhead type.

7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

2.3 MANUFACTURED SUPPORTING DEVICES

A. General: Provide supporting devices, complying with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation, and as specified in this Section. Where more than one type of device meets indicated requirements, select device according to Contractor's option.

1. Fasteners:

a. Standard Bolts and Nuts: ASTM A 307, Grade A, regular hexagon head.
b. Lag Bolts: FS FF-B-561, square head type.
c. Machine Screws: FS FF-S-92, cadmium plated steel.
d. Machine Bolts: FS FF-B-584 heads; FF-N-836 nuts.
e. Wood Screws: FS FF-S-111 flat head carbon steel.
f. Plain Washers: FS FF-W-92, round, general assembly grade carbon steel.
g. Lock Washers: FS FF-W-84, helical spring type carbon steel.
h. Toggle Bolts: Tumble-wing type; FS FF-B-588, type, class and style as required to sustain load.
i. Stainless Steel Fasteners: Type 302 for interior Work; Type 316 for exterior Work.

PART 3 - EXECUTION

3.1 SELECTION

A. Comply with the following standards for selection and installation of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA NEIS 101
2. NECA NEIS 102.
3. NECA NEIS 105.
4. NECA NEIS 111.

B. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

C. Comply with requirements for raceways specified in Section 260533.13 "Conduits for Electrical Systems."

D. Comply with requirements for boxes specified in Section 260533.16 "Boxes and Covers for Electrical Systems."

E. Provide vibration and seismic controls with hangers and supports in accordance with requirements specified in "Section 260548 "Vibration and Seismic Controls for Electrical Systems."

F. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and ERMC as scheduled in NECA NEIS 1, where its Table 1 lists maximum

spacings that are less than those stated in NFPA 70. Minimum rod size must be 1/4 inch in diameter.

G. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

H. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2 inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 INSTALLATION OF SUPPORTS

A. Comply with NECA NEIS 101 for installation requirements except as specified in this article.

B. Raceway Support Methods: In addition to methods described in NECA NEIS 1, EMT and ERMC may be supported by openings through structure members, in accordance with NFPA 70.

C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination must be weight of supported components plus 200 lb.

D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inch (100 mm) thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inch thick.
6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts, Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69 - Spring-tension clamps.
7. To Light Steel: Sheet metal screws.
8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that comply with seismic-restraint strength and anchorage requirements.

E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M. Submit welding certificates.

END OF SECTION 260529

SECTION 260533.13 - CONDUITS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Type EMT-S duct raceways and elbows. (aka; EMT)
2. Type ERMC-S duct raceways, elbows, couplings, and nipples. (aka; RMC, RGS or GRS)
3. Type FMC-S duct raceways. (aka; FMC)
4. Type LFMC-S duct raceways. (aka; LFMC)
5. Type LFNC duct raceways.
6. Fittings for conduit, tubing, and cable.
7. Electrically conductive corrosion-resistant compounds for threaded conduit.
8. Solvent cements.

B. Products Installed, but Not Furnished, under This Section:

1. See Section 260553 "Identification for Electrical Systems" for electrical equipment labels.

1.2 DEFINITIONS

A. Conduit: A structure containing one or more duct raceways.

B. Duct Raceway: A single enclosed raceway for conductors or cable.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Type EMT-S duct raceways and elbows.
2. Type ERMC-S duct raceways, elbows, couplings, and nipples.
3. Type FMC-S duct raceways.
4. Type LFMC-S duct raceways.
5. Type LFNC duct raceways.
6. Fittings for conduit, tubing, and cable.
7. Electrically conductive corrosion-resistant compounds for threaded conduit.
8. Solvent cements.

B. Sustainable design submittals.

1. Solvent cements.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions:

1. Type EMT-S duct raceways and elbows.
2. Type ERMC-S duct raceways, elbows, couplings, and nipples.
3. Type FMC-S duct raceways.
4. Type LFMC-S duct raceways.
5. Type LFNC duct raceways.
6. Fittings for conduit, tubing, and cable.
7. Electrically conductive corrosion-resistant compounds for threaded conduit.
8. Solvent cements.

PART 2 - PRODUCTS

2.1 TYPE EMT-S DUCT RACEWAYS AND ELBOWS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN FJMX; including UL 797.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL FJMX - Steel Electrical Metal Tubing (EMT-S) and Elbows:

1. Material: Steel.
2. Options:

   a. Exterior Coating: Zinc.
   b. Interior Coating: Zinc.
   c. Minimum Trade Size: 1/2”.

2.2 TYPE ERMC-S DUCT RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN DYIX; including UL 6.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.

2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DYIX - Galvanized-Steel Electrical Rigid Metal Conduit (ERMC-S-G), Elbows, Couplings, and Nipples:

1. Exterior Coating: Zinc.
2. Options:

a. Interior Coating: Zinc
b. Minimum Trade Size: ½”.

2.3 TYPE FMC-S DUCT RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN DXUZ; including UL 1.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DXUZ - Steel Flexible Metal Conduit (FMC-S):

1. Material: Steel.
2. Options:

a. Minimum Trade Size: 1/2”.

2.4 TYPE LFMC DUCT RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN DXHR; including UL 360.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DXHR - Steel Liquid-tight Flexible Metal Conduit (LFMC-S):

1. Material: Steel.
2. Options:

a. Minimum Trade Size: 1/2”.
b. Colors: As indicated on Drawings.

2.5 TYPE LFNC DUCT RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN DXOQ; including UL 1660.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DXOQ - Layered (Type A) Liquid-tight Flexible Nonmetallic Conduit (LFNC-A):

1. Additional Criteria: Type A conduit with smooth seamless inner core and cover bonded together with one or more reinforcement layers between core and cover.
2. Options:

a. Minimum Trade Size: 1/2”
b. Markings: 105 deg C dry, Sunlight resistant, Complies with flame test in cable trays.

2.6 FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN DZYR; including UL 651.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

2.7 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL EBMB - Duct Fittings for Hazardous (Classified) Locations:
1. Listing Criteria: UL CCN EBMB; including UL 1203.

D. UL DWTT - Fittings for Type ERMC, Type IMC, Type PVC:

1. Listing Criteria: UL CCN DWTT; including UL 514B.
2. Options:

a. Material: Steel.
b. Coupling Method: Compression coupling, Raintight compression coupling with distinctive color gland nut, Setscrew coupling.
c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

E. UL FKAV - Fittings for Type EMT-S Duct Raceways:

1. Listing Criteria: UL CCN FKAV; including UL 514B.
2. Options:

a. Material: Steel.
b. Coupling Method: Compression coupling, Raintight compression coupling with distinctive color gland nut.
c. Expansion and Deflection Fittings: UL 651 with flexible bonding jumper.

F. UL ILNR - Fittings for Type FMC Duct Raceways:

1. Listing Criteria: UL CCN ILNR; including UL 514B.

G. UL DXAS - Fittings for Type LFMC and Type LFNC Duct Raceways:

1. Listing Criteria: UL CCN DXAS; including UL 514B.

2.8 ELECTRICALLY CONDUCTIVE CORROSION-RESISTANT COMPOUNDS FOR THREADED CONDUIT

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN FOIZ; including UL Subject 2419.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL FOIZ - Electrically Conductive Corrosion-Resistant Compound for Threaded Conduit:

2.9 SOLVENT CEMENTS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN DWTT; including UL 514B.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Sustainable Design Submittals: Prepare and submit the following documentation:
3. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL DWTT - Solvent Cements for Type PVC Duct Raceways and Fittings:

PART 3 - EXECUTION

3.1 SELECTION OF CONDUITS FOR ELECTRICAL SYSTEMS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of duct raceways. Consult Architect for resolution of conflicting requirements.

B. Outdoors:

1. Exposed and Subject to Severe Physical Damage: ERMC.
2. Exposed and Subject to Physical Damage: ERMC.

   a. Locations less than 10 ft above finished floor.
   b. Fan/Mechanical/Boiler Rooms, Storage Rooms, Garages.

c. Loading docks.

3. Exposed and Not Subject to Physical Damage: ERMC, EMT-S, PVC-80.
4. Concealed Aboveground: ERMC, EMT-S.
5. Direct Buried: PVC-80.
6. Concrete Encased Not in Trench: PVC-80, PVC-40.
7. Concrete Encased in Trench: PVC-80, PVC-40.
8. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

C. Indoors:

1. Hazardous Classified Locations: ERMC.
2. Exposed and Subject to Severe Physical Damage: ERMC. Locations include the following:

   a. Loading docks.
   b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
   c. Mechanical rooms.
   d. Industrial spaces.

3. Exposed and Subject to Physical Damage: ERMC. Locations include the following:

   a. Locations less than 10 ft above finished floor.
   b. Stub-ups to above suspended ceilings.

4. Exposed and Not Subject to Physical Damage: ERMC, EMT-S.
5. Concealed in Ceilings and Interior Walls and Partitions: ERMC, EMT-S.
6. Damp or Wet Locations: ERMC, Corrosion-resistant EMT-S.
7. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC, FMC, LFNC.

D. Duct Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.

1. ERMC: Provide threaded-type fittings unless otherwise indicated.

3.2 INSTALLATION OF CONDUITS FOR ELECTRICAL SYSTEMS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Type EMT-S: Article 358 of NFPA 70 and NECA NEIS 101.
2. Type ERMC-S: Article 344 of NFPA 70 and NECA NEIS 101.
3. Type FMC-S: Article 348 of NFPA 70 and NECA NEIS 101.
4. Type LFMC: Article 350 of NFPA 70 and NECA NEIS 101.
5. Type LFNC: Article 342 of NFPA 70 and NECA NEIS 111.
6. Type PVC: Article 356 of NFPA 70 and NECA NEIS 111.
7. Expansion Fittings: NEMA FB 2.40.

8. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. General Requirements for Installation of Duct Raceways:

a. Complete duct raceway installation before starting conductor installation.
b. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft above finished floor.
c. Install no more than equivalent of three 90-degree bends in conduit run**.** Support within 12 inch of changes in direction.
d. Make bends in duct raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
e. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
f. Support conduit within 12 inch of enclosures to which attached.
g. Install duct sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed duct raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install duct sealing fittings in accordance with NFPA 70.
h. Install devices to seal duct raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of duct raceways at the following points:

1) Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2) Where an underground service duct raceway enters a building or structure.
3) Conduit extending from interior to exterior of building.
4) Conduit extending into pressurized duct raceway and equipment.
5) Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
6) Where otherwise required by NFPA 70.

i. Do not install duct raceways or electrical items on "explosion-relief" walls or rotating equipment.
j. Do not install conduits within 2 inch of the bottom side of a metal deck roof.
k. Keep duct raceways at least 6 inch away from parallel runs of flues and steam or hot-water pipes. Install horizontal duct raceway runs above water and steam piping.
l. Cut conduit perpendicular to the length. For conduits trade size 2 and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
m. Install pull wires in empty duct raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb tensile strength. Leave at least 36 inch of slack at both ends of pull wire. Cap underground duct raceways designated as spare above grade alongside duct raceways in use. Use factory produced cap, adhesive tape will not be permitted.
n. Install duct raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.

1) Termination fittings with shoulders do not require two locknuts.

o. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to trade size 1-1/4, and insulated throat metal bushings on trade size 1-1/2, and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

2. Types EMT-S, ERMC, and FMC: Do not install aluminum duct raceways or fittings in contact with concrete or earth.

3. Types ERMC:

a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of duct raceway and fittings before making up joints. Follow compound manufacturer's published instructions.

4. Types FMC, LFMC, and LFNC:

a. Provide a minimum of 36 inch, and maximum of 72” of flexible conduit for recessed and semi-recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

5. Types PVC:

a. Do not install Type PVC conduit where ambient temperature exceeds 122 deg F. Conductor ratings must be limited to 75 deg C except where installed in a trench outside buildings with concrete encasement, where 90 deg C conductors are permitted.
b. Comply with manufacturer's published instructions for solvent welding and fittings.

6. Duct Raceways Embedded in Slabs:
a. Not permitted.

7. Stub-ups to Above Recessed Ceilings:

a. Provide EMT-S, or ERMC for duct raceways.
b. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

8. Duct Raceway Terminations at Locations Subject to Moisture or Vibration:

a. Provide insulating bushings to protect conductors, including conductors smaller than 4 AWG. Install insulated throat metal grounding bushings on service conduits.

9. Duct Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.

a. ERMC-S-PVC: Provide only fittings listed for use with this type of conduit. Patch and seal joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Provide sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.

b. EMT-S: Provide compression and steel fittings. Comply with NEMA FB 2.10.

c. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.

10. Expansion-Joint Fittings:

a. Install expansion-joint fittings in runs of aboveground PVC that are located where environmental temperature change may exceed 30 deg F and that have straight-run length that exceeds 25 ft. Install in runs of aboveground ERMC and EMT-S conduit that are located where environmental temperature change may exceed 100 deg F and that have straight-run length that exceeds 100 ft.

b. Install type and quantity of fittings that accommodate temperature change listed for the following locations:

1) Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
2) Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
3) Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
4) Attics: 135 deg F temperature change.

c. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.

d. Install expansion fittings at locations where conduits cross building or structure expansion joints.

e. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's published instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

11. Duct Raceways Penetrating Rooms or Walls with Acoustical Requirements: Seal duct raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.

12. Identification: Campus Standards require color identification of all conduits as follows.
a. Emergency Systems – Orange conduit and ducts.
b. Fire Alarm – Red conduit and ducts.
c. Telecommunications – Blue conduits and ducts.

D. Interfaces with Other Work:

1. Coordinate installation of new products for use with existing conditions.

2. Coordinate with Section 078413 "Penetration Firestopping" for installation of firestopping at penetrations of fire-rated floor and wall assemblies.

3. Coordinate with Section 260529 "Hangers and Supports for Electrical Systems" for installation of conduit hangers and supports.

3.3 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533.13

SECTION 260533.16 - BOXES AND COVERS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Junction boxes and pull boxes.
3. Cover plates for device boxes.
4. Hoods for outlet boxes.

B. Products Installed, but Not Furnished, under This Section:

1. See Section 260553 "Identification for Electrical Systems" for electrical equipment labels.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Nonmetallic outlet boxes, device boxes, rings, and covers.
3. Junction boxes and pull boxes.
4. Cover plates for device boxes.
5. Hoods for outlet boxes.

B. Shop Drawings:

1. Shop drawings for floor boxes.

C. Samples:

1. Floor box samples for initial selection.
2. Raised floor box samples for initial selection.
3. Recessed access-floor box samples for initial selection.
4. Concrete box samples for initial selection.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions:

1. Metallic outlet boxes, device boxes, rings, and covers.
2. Nonmetallic outlet boxes, device boxes, rings, and covers.
3. Junction boxes and pull boxes.
4. Cover plates for device boxes.
5. Hoods for outlet boxes.

PART 2 - PRODUCTS

2.1 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN QCIT; including UL 514A.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
3. Samples:

a. Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
b. Raised Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
c. Recessed Access-Floor Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.
d. Concrete Box Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors and flooring inserts for each type of floor box.

C. UL QCIT - Metallic Outlet Boxes and Covers:

1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
2. Options:

a. Material: Sheet steel, Cast metal.
b. Sheet Metal Depth: Minimum 2.8 inch, 3.5 inch.
c. Cast-Metal Depth: Minimum 2.4 inch.
d. Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing more than 50 lb and marked with maximum allowable weight.
e. Paddle Fan Outlet Boxes and Covers: Nonadjustable, designed for attachment of paddle fan weighing up to 70 lb.

D. UL QCIT - Metallic Conduit Bodies:

1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.

E. UL QCIT - Metallic Device Boxes:

1. Description: Box with provisions for mounting wiring device directly to box.
2. Options:

   a. Material: Sheet steel, Cast metal.
   b. Sheet Metal Depth: minimum 2.8 inch.
   c. Cast-Metal Depth: minimum 2.4 inch.

F. UL QCIT - Metallic Extension Rings:

1. Description: Ring intended to extend sides of outlet box or device box to increase box depth, volume, or both.

G. UL QCIT - Metallic Floor Boxes and Floor Box Covers:

1. Description: Box mounted in floor with floor box cover and other components to complete floor box enclosure.

H. UL QCIT - Metallic Concrete Boxes and Covers:

1. Description: Box intended for use in poured concrete.

2.2 JUNCTION BOXES AND PULL BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. Listing Criteria: UL CCN BGUZ; including UL 50 and UL 50E.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Sustainable Design Submittals: Prepare and submit the following documentation for adhesive solvents:

3. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL BGUZ - Indoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.

D. UL BGUZ - Indoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.

E. UL BGUZ - Outdoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Options:

a. Degree of Protection: Type 3R, Type 4.

F. UL BGUZ - Outdoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Options:

a. Degree of Protection: Type 3R, Type 4.

2.3 COVER PLATES FOR DEVICES BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
2. Listing Criteria: UL CCN QCIT or UL CCN QCMZ; including UL 514D.
3. Wallplate-Securing Screws: Metal with head color to match wall-plate finish.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.

2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL QCIT or QCMZ - Metallic Cover Plates for Device Boxes:
1. Options:

a. Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
b. Wallplate Material: .032 inch thick, Type 302/304 non-magnetic stainless steel with brushed finish.

2.4 HOODS FOR OUTLET BOXES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

2. Listing Criteria:

   a. UL CCN QCIT or UL CCN QCMZ; including UL 514D.
   b. Receptacle, Hood, Cover Plate, Gaskets, and Seals: UL 498 Supplement SA when mated with box or enclosure complying with UL 514A, UL 514C, or UL 50E.

3. Mounts to box using fasteners different from wiring device.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL QCIT or QCMZ - Extra-Duty, While-in-Use Hoods for Outlet Boxes:

1. Additional Characteristics: Marked "Extra-Duty" in accordance with UL 514D.
2. Options:

   a. Provides gray, weatherproof, "while-in-use" cover.
   b. Manufacturer may combine nonmetallic device box with hood as extra-duty rated assembly.

PART 3 - EXECUTION

3.1 PREPARATION

A. Shop Drawings: Prepare and submit the following:

1. Shop Drawings for Floor Boxes: Show that floor boxes are located to avoid interferences and are structurally allowable. Indicate floor thickness at location where boxes are embedded in concrete floors and underfloor clearances where boxes are installed in raised floors.

3.2 SELECTION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.

B. Degree of Protection:

1. Outdoors:

   a. Type 3R unless otherwise indicated.
   b. Locations Exposed to Hosedown: Type 4.
   c. Locations Subject to Potential Flooding: Type 6P.
   d. Locations Aboveground Where Mechanism Must Operate When Ice Covered: Type 3S.

e. Locations in-Ground or Exposed to Corrosive Agents: Type 4X.
f. Locations in-Ground or Exposed to Corrosive Agents Where Mechanism Must Operate When Ice Covered: Type 3SX.

2. Indoors:

a. Type 1 unless otherwise indicated.
b. Damp or Dusty Locations: Type 2, Type 4
c. Surface Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
d. Flush Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12, Type 12K.
e. Locations Exposed to Airborne Dust, Lint, Fibers, or Flyings: Type 4.
f. Locations Exposed to Hosedown: Type 4, Type 6.

C. Exposed Boxes Installed Less Than 2.5 m (8 ft) Above Floor:

1. Provide cast-metal boxes, Boxes with knockouts or unprotected openings are prohibited.
2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

3.3 INSTALLATION OF BOXES AND COVERS FOR ELECTRICAL SYSTEMS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Outlet, Device, Pull, and Junction Boxes: Article 314 of NFPA 70.
2. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
2. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.
3. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box, whether installed indoors or outdoors.
4. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
5. Locate boxes so that cover or plate will not span different building finishes.
6. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
7. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
8. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.

9. Set metal floor boxes level and flush with finished floor surface.
10. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.
11. Do not install aluminum boxes, enclosures, or fittings in contact with concrete or earth.
12. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
13. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:

    a. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
    b. Provide gaskets for wall plates and covers.

14. Identification: Provide labels for boxes and associated electrical equipment.

    a. Identify field-installed conductors, interconnecting wiring, and components.
    b. Provide warning signs.
    c. Label each box with engraved metal or laminated-plastic nameplate.

3.4 PROTECTION

A. After installation, protect boxes from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 260533.16

SECTION 260533.23 - SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Surface metal raceways and fittings.
2. Surface nonmetallic raceways.
3. Wireways and auxiliary gutters.

B. Products Installed, but Not Furnished, under This Section:

1. See Section 260553 "Identification for Electrical Systems" for electrical equipment labels.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Surface metal raceways and fittings.
2. Surface nonmetallic raceways.
3. Wireways and auxiliary gutters.

B. Samples:

1. Surface metal raceway nonmetallic cover samples for initial selection.
2. Surface nonmetallic raceway samples for initial selection.
3. Nonmetallic wireway and auxiliary gutter samples for initial selection.

C. Sustainable design submittals.

1. Surface metal raceways and fittings.
2. Surface nonmetallic raceways.
3. Wireways and auxiliary gutters.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions:

1. Surface metal raceways and fittings.
2. Surface nonmetallic raceways.
3. Wireways and auxiliary gutters.

PART 2 - PRODUCTS

2.1 SURFACE METAL RACEWAYS AND FITTINGS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN RJBT; including UL 5.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
3. Samples:

a. Surface Metallic Raceway Nonmetallic Cover Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type, 12 inch long.

C. UL RJBT - Surface Metal Raceways and Fittings with Metal Covers:

1. Options:

a. Galvanized steel base with snap-on covers.
b. Manufacturer's standard enamel finish in color selected by Architect.
c. Wiring Channels: Single.

2.2 SURFACE NONMETALLIC RACEWAYS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria:

a. UL CCN RJTX; including UL 5A.
b. UL 94, V-0 requirements for self-extinguishing characteristics.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.
3. Samples:

a. Surface Nonmetallic Raceway Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type, 12 inch long.

C. UL RJTX - Surface Nonmetallic Raceways and Fittings with Nonmetallic Covers:

1. Options:

a. Provide texture and color selected by Architect from manufacturer's standard colors.
b. Wiring Channels: Single. Multiple channels must be capable of housing a standard 20 to 30 A device flush within the raceway.

2.3 WIREWAYS AND AUXILIARY GUTTERS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria:

a. UL CCN ZOYX; including UL 870.
b. UL 94, V-0 requirements for self-extinguishing characteristics.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL ZOYX - Metal Wireways and Auxiliary Gutters:

a. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
b. Finish: Manufacturer's standard enamel finish.

2. Options:

a. Degree of Protection: Type 3R unless otherwise indicated.
b. Wireway Covers: Flanged-and-gasketed type unless otherwise indicated.

PART 3 - EXECUTION

3.1 INSTALLATION OF SURFACE RACEWAYS FOR ELECTRICAL SYSTEMS

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Auxiliary Gutters: Article 366 of NFPA 70.
2. Surface Metal Raceway: Article 386 of NFPA 70.
3. Surface Nonmetallic Raceway: Article 388 of NFPA 70.
4. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Install surface raceways only where indicated on Drawings.
2. Install surface raceway with a minimum 2-inch radius control at bend points.
3. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inch and with no less than two supports per straight raceway section. Support surface raceway in accordance with manufacturer's published instructions. Tape and glue are unacceptable support methods.
4. Identification: Provide labels for surface raceways and associated electrical equipment.

   a. Identify field-installed conductors, interconnecting wiring, and components.
   b. Provide warning signs.

3.2 PROTECTION

A. After installation, protect surface raceways from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 260533.23

SECTION 260543 - UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Direct buried conduit, ducts, and duct accessories.
2. Concrete encased conduit, ducts and duct accessories.
3. Handholes and pull boxes.
4. Manholes.

1.3 DEFINITION

A. RMC: Rigid metallic conduit.

1.4 SUBMITTALS, GENERAL

A. General: Submit all action submittals and informational submittals required by this Section concurrently.

1.5 ACTION SUBMITTALS

A. Product Data: For the following:

1. Duct-bank materials, including separators and miscellaneous components.
2. Ducts and conduits and their accessories, including elbows, end bells, bends, fittings, and solvent cement.
3. Accessories for manholes, handholes, pull boxes and other utility structures.
4. Warning tape.

1.6 QUALITY ASSURANCE

A. Comply with IEEE C2.
B. Comply with NFPA 70.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver ducts to Project site with ends capped. Store nonmetallic ducts with supports to prevent bending, warping, and deforming.

B. Store factory-fabricated underground utility structures at Project site as recommended by manufacturer to prevent physical damage. Arrange so identification markings are visible.

C. Lift and support precast concrete units only at designated lifting or supporting points.

1.8 PROJECT CONDITIONS

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Construction Manager no fewer than seven (7) days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Construction Manager's written permission.

1.9 COORDINATION

A. Coordinate layout and installation of conduits, ducts, manholes, handholes, and pull boxes with final arrangement of other utilities, site grading, and surface features as determined in the field.

B. Coordinate elevations of conduits, ducts and duct-bank entrances into manholes, handholes, and pull boxes with final locations and profiles of ducts and duct banks as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations from those indicated as required to suit field conditions and to ensure that conduit and duct runs drain to manholes and handholes, and as approved by Architect.

PART 2 - PRODUCTS

2.1 CONDUIT

A. Rigid Metallic Conduit (RMC): Galvanized. Comply with ANSI C80.1.

2.2 HANDHOLES AND PULL BOXES OTHER THAN PRECAST CONCRETE

A. Description: Comply with SCTE 77.

1. Color: Gray to suit location.

2. Configuration: Units shall be designed for flush burial and have open bottom unless otherwise indicated.

3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure.

4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.

5. Cover Legend: Molded lettering.

   a. As indicated for each service.
   b. Tier level number, indicating that the unit complies with the structural load test for that tier according to SCTE 77.

6. Direct-Buried Wiring Entrance Provisions: Knockouts equipped with insulated bushings or end-bell fittings, retained to suit box material, sized for wiring indicated, and arranged for secure, fixed installation in enclosure wall.

7. Duct Entrance Provisions: Duct-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

8. Handholes 12 inches wide by 24 inches long and larger shall have factory-installed inserts for cable racks and pulling-in irons.

B. Polymer Concrete Handholes and Pull Boxes with Polymer Concrete Cover: Molded of sand and aggregate, bound together with a polymer resin, and reinforced with steel or fiberglass or a combination of the two. Handholes and pull boxes shall comply with the requirements of SCTE 7 Tier 15 loading.

   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

      a. Armorcast Products Company.
      b. Carson Industries LLC.
      c. CDR Systems Corporation.
      d. Hubbell Power Systems;
      e. NewBasis.

C. Fiberglass Handholes and Pull Boxes with Polymer Concrete Frame and Cover: Complying with SCTE 77 Tier 15 loading. Sheet-molded, fiberglass-reinforced, polyester resin enclosure joined to polymer concrete top ring or frame.

   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   2. Basis-of-Design Product: Subject to compliance with requirements or comparable product by one of the following:

      a. Armorcast Products Company.
      b. Carson Industries LLC.
      c. Christy Concrete Products.
      d. Synertech Moulded Products, Inc.; a division of Oldcastle Precast.

2.3 UTILITY STRUCTURE ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Bilco Company (The).
2. Campbell Foundry Company.
3. Christy Concrete Products.
4. East Jordan Iron Works.
5. Elmhurst-Chicago Stone Co.
6. Hubbell Power Systems; Lenoir City Division. (verify)
7. McKinley Iron Works.
8. Neenah Foundry Company.
9. NewBasis.
10. Oldcastle Precast Group.
11. Osburn Associates, Inc.
12. Pennsylvania Insert Corporation.
13. Riverton Concrete Products; a division of Cretex Companies, Inc.
14. Underground Devices, Inc.
15. Utility Concrete Products, LLC.
16. Wausau Tile Inc.

B. Ferrous metal hardware, where indicated, shall be hot-dip galvanized complying with ASTM A 153 and A 123.

C. Pulling Eyes in Concrete Walls: Eyebolt with reinforcing-bar fastening insert, 2-inch-diameter eye, and 1-by-4-inch bolt.

1. Working Load Embedded in 6-Inch, 4000-psi Concrete: 13,000-lbf minimum tension.

D. Pulling Eyes in Nonconcrete Walls: Eyebolt with reinforced fastening, 1-1/4-inch-diameter eye, rated 2500-lbf minimum tension.

E. Pulling-In and Lifting Irons in Concrete Floors: 7/8-inch-diameter, hot-dip galvanized, bent steel rod; stress relieved after forming; and fastened to reinforcing rod. Exposed triangular opening.

1. Ultimate Yield Strength: 40,000-lbf shear and 60,000-lbf tension.

F. Bolting Inserts for Concrete Utility Structure Cable Racks and Other Attachments: Flared, threaded inserts of noncorrosive, chemical-resistant, nonconductive thermoplastic material; 1/2-inch ID by 2-3/4 inches deep, flared to 1-1/4 inches minimum at base.

1. Tested Ultimate Pullout Strength: 12,000 lbf minimum.

G. Expansion Anchors for Installation after Concrete Is Cast: Zinc-plated, carbon-steel-wedge type with stainless-steel expander clip with 1/2-inch bolt, 5300-lbf rated pullout strength, and minimum 6800-lbf rated shear strength.

H. Cable Rack Assembly: Steel, hot-dip galvanized except insulators.

1. Stanchions: T-section or channel; 2-1/4-inch nominal size; punched with 14 holes on 1-1/2-inch centers for cable-arm attachment.

2. Arms: 1-1/2 inches wide, lengths ranging from 3 inches with 450-lb minimum capacity to 18 inches with 250-lb minimum capacity. Arms shall have slots along full length for cable ties and be arranged for secure mounting in horizontal position at any vertical location on stanchions.

3. Insulators: High-glaze, wet-process porcelain arranged for mounting on cable arms.

I. Cable Rack Assembly: Nonmetallic. Components fabricated from nonconductive, fiberglass-reinforced polymer.

1. Stanchions: Nominal 36 inches high by 4 inches wide, with minimum of 9 holes for arm attachment.

2. Arms: Arranged for secure, drop-in attachment in horizontal position at any location on cable stanchions, and capable of being locked in position. Arms shall be available in lengths ranging from 3 inches with 450-lb minimum capacity to 20 inches with 250-lb minimum capacity. Top of arm shall be nominally 4 inches wide, and arm shall have slots along full length for cable ties.

J. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Capable of withstanding temperature of 300 deg F without slump and adhering to clean surfaces of plastic ducts, metallic conduits, conduit coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals.

PART 3 - EXECUTION

3.1 COORDINATION:

A. Coordinate all installations with Construction Manager, Div01 and Div31.

3.2 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as shown on drawing details for pipe less than 6 inches in nominal diameter.

2. Install backfill as shown on drawing details.

3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches (300 mm) of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction shown on drawing details.

4. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor, unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.

5. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

   a. Couple steel conduits to ducts with adapters designed for this purpose and encase coupling with 3 inches of concrete.

   b. For stub-ups at equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

6. Warning tape: Bury warning tape approximately 12 inches above direct-buried conduits.

3.3 UNDERGROUND DUCT APPLICATION

A. Ducts for Electrical Cables over 600 V: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank unless otherwise indicated.

B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank unless otherwise indicated.

C. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.

D. Ducts for Electrical Branch Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.

E. Underground Ducts for Telephone, Communications, or Data Utility Service Cables: RNC, NEMA Type EPC-40-PVC, in concrete-encased duct bank unless otherwise indicated.

F. Underground Ducts for Telephone, Communications, or Data Utility Service Cables: RNC, NEMA Type EPC-40-PVC installed in concrete-encased duct bank unless otherwise indicated.

G. Underground Ducts for Telephone, Communications, or Data Circuits: RNC, NEMA Type EPC-40-PVC, in direct-buried duct bank unless otherwise indicated.

H. Underground Ducts Crossing Paved Paths, Walks and Driveways Roadways and Railroads: RNC, NEMA Type EPC-40-PVC, encased in reinforced concrete.

3.4 UNDERGROUND ENCLOSURE APPLICATION

A. Handholes and Pull Boxes for 600 V and Less, Including Telephone, Communications, and Data Wiring:

   1. Units in Roadways and Other Deliberate Traffic Paths: Precast concrete. AASHTO HB 17, H-10, H-20 structural load rating.

2. Units in Driveway, Parking Lot, and Off-Roadway Locations, Subject to Occasional, Nondeliberate Loading by Heavy Vehicles: Precast concrete, AASHTO HB 17, H-20 structural load rating.

3. Units in Sidewalk and Similar Applications with a Safety Factor for Nondeliberate Loading by Vehicles: Precast concrete, AASHTO HB 17, H-10 structural load rating.

4. Units Subject to Light-Duty Pedestrian Traffic Only: Fiberglass-reinforced polyester resin, structurally tested according to SCTE 77 with 3000-lbf "Light-Duty" vertical loading.

3.5 DUCT INSTALLATION

A. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes to drain in both directions.

B. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of 48 inches both horizontally and vertically, at other locations unless otherwise indicated.

C. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.

D. Duct Entrances to Manholes and Concrete and Polymer Concrete Handholes: Use end bells, spaced approximately 10 inches on center for 5-inch ducts, and vary proportionately for other duct sizes.

1. Begin change from regular spacing to end-bell spacing 10 ft. from the end bell without reducing duct line slope and without forming a trap in the line.
2. Direct-Buried Duct Banks: Install an expansion and deflection fitting in each conduit in the area of disturbed earth adjacent to manhole or handhole.
3. Grout end bells into structure walls from both sides to provide watertight entrances.

E. Building Wall Penetrations: Make a transition from underground duct to rigid steel conduit at least 10 ft. outside the building wall without reducing duct line slope away from the building and without forming a trap in the line. Use fittings manufactured for duct-to-conduit transition.

F. Sealing: Provide temporary closure at terminations of ducts that have cables pulled. Seal spare ducts at terminations. Use sealing compound and plugs to withstand at least 15-psig hydrostatic pressure.

G. Pulling Cord: Install 100-lbf- test nylon cord in ducts, including spares.

H. Concrete-Encased Ducts: Support ducts on duct separators.

1. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than [5] spacers per 20 ft. of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together using fabric straps; do not use tie wires or

reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.

2. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.

   a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.

   b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing rod dowels extending 18 inches into concrete on both sides of joint near corners of envelope.

3. Pouring Concrete: Spade concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Use a plank to direct concrete down sides of bank assembly to trench bottom. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.

4. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.

5. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.

6. Minimum Space between Ducts. As shown on details on Drawings.

7. Depth: As shown on details on Drawings.

8. Manufactured PVC duct elbows in first subparagraph below are vulnerable to damage by pulling lines when cable pulling tensions are high. However, concrete encasement, together with reduced pulling tensions, can prevent serious damage. Reduce potential pulling tensions by making duct runs from the closest manhole or handhole as short as possible and arranging stub-up elbows to have the longest possible radius. 5-inch (125-mm) duct is available in standard radii of 24, 36, 48, and 60 inches (300, 900, 1200, and 1500 mm) and greater. If necessary, specify that stub-ups be made with rigid steel conduit elbows as provided in second subparagraph below.

9. Stub-Ups: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

   a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.

   b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.

10. Warning Tape: Bury warning tape above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of the centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

I. Direct-Buried Duct Banks:

1. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.

2. Space separators close enough to prevent sagging and deforming of ducts, with not less than five (5) spacers per 20 ft. of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.

3. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as shown on details on Drawings for pipes less than 6 inches in nominal diameter.

4. Install backfill as shown on details on Drawings.

5. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand-place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction as specified in Division 31 Section "Earth Moving".

6. Install ducts with a minimum of 3 inches between ducts for like services and 12 inches between power and signal ducts.

7. Depth: Install top of duct bank at least 36 inches below finished grade unless otherwise indicated.

8. Set elevation of bottom of duct bank below the frost line.

9. Install manufactured duct elbows for stub-ups at poles and equipment and at building entrances through the floor unless otherwise indicated. Encase elbows for stub-up ducts throughout the length of the elbow.

10. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through the floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.

    b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

3.6 INSTALLATION OF HANDHOLES AND PULL BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and pull boxes level and plumb and with orientation and depth coordinated with connecting ducts to minimize bends and deflections required for proper entrances. Use pull box extension if required to match depths of ducts, and seal joint between box and extension as recommended by the manufacturer.

B. Unless otherwise indicated, support units on a level 6-inch- thick bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: Set so cover surface will be flush with finished grade.

D. Install handholes and pull boxes with bottom below the frost line below grade or as indicated on details on Drawings.

E. Install removable hardware, including pulling eyes, cable stanchions, cable arms, and insulators, as required for installation and support of cables and conductors and as indicated. Retain arm lengths to be long enough to provide spare space for future cables, but short enough to preserve adequate working clearances in the enclosure.

F. Field-cut openings for ducts and conduits according to enclosure manufacturer's written instructions. Cut wall of enclosure with a tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

3.7 GROUNDING

A. Ground underground ducts and utility structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."

3.8 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.

2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.

3. Test manhole grounding to ensure electrical continuity of grounding and bonding connections. Measure and report ground resistance as specified in Division 26 Section "Grounding and Bonding for Electrical Systems."

B. Correct deficiencies and retest as specified above to demonstrate compliance.

C. Prepare test and inspection reports.

3.9 CLEANING

A. Pull leather-washer-type duct cleaner, with graduated washer sizes, through full length of ducts. Follow with rubber duct swab for final cleaning and to assist in spreading lubricant throughout ducts.

B. Clean internal surfaces of manholes, including sump. Remove foreign material.

END OF SECTION 26 05 43

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

1.1 SUMMARY

A. Section Includes:

1. Round sleeves.
2. Rectangular sleeves.
3. Sleeve-seal systems.
4. Sleeve-seal fittings.
5. Grout.
6. Pourable sealants.
7. Foam sealants.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 ROUND SLEEVES

A. Steel Wall Sleeves:

1. General Characteristics: ASTM A53/A53M, Type E, Grade B, Schedule 40, zinc coated, plain ends and integral water stop.

B. Round, Galvanized-Steel, Sheet Metal Sleeves:

1. General Characteristics: Galvanized-steel sheet; thickness not less than 0.0239 inch; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

2.2 SLEEVE-SEAL SYSTEMS

A. General Characteristics: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable or between raceway and cable.

B. Options:

1. Rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Stainless steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. General Characteristics: Manufactured plastic, sleeve-type, water stop assembly made for embedding in concrete slab or wall. Unit must have plastic or rubber water stop collar with center opening to match piping OD.

2.4 GROUT

A. General Characteristics: Non-shrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

1. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
2. Design Mix: 5000 psi, 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

2.5 POURABLE SEALANTS

A. Performance Criteria:

1. General Characteristics: Single-component, neutral-curing elastomeric sealants of grade indicated below.

a. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

2.6 FOAM SEALANTS

A. Performance Criteria:

1. General Characteristics: Multicomponent, liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam. Foam expansion must not damage cables or crack penetrated structure.

PART 3 - EXECUTION

3.1 INSTALLATION OF SLEEVES FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Sleeves for Conduits Penetrating Above-Grade, Non-Fire-Rated, Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall or floor so no voids remain. Tool exposed surfaces smooth; protect material while curing.

b. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Section 079200 "Joint Sealants."

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4 inch annular clear space between sleeve and raceway or cable, unless sleeve-seal system is to be installed or seismic criteria require different clearance.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inch above finished floor level. Install sleeves during erection of floors.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Wall Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for wall assemblies.

C. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

D. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve-seal systems. Size sleeves to allow for 1 inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

E. Underground, Exterior-Wall and Floor Penetrations:

1. Install steel pipe sleeves with integral water stops. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system. Install sleeve during construction of floor or wall.
2. Install steel pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system. Grout sleeve into wall or floor opening.

3.2 INSTALLATION OF SLEEVE-SEAL SYSTEMS

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

END OF SECTION 260544

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Labels.
2. Extruded insulating tubing.
3. Bands.
4. Tapes and stencils.
5. Tags.
6. Signs.
7. Cable ties.

1.2 ACTION SUBMITTALS

A. Product data.

B. Samples: For each type of label and sign to illustrate composition, size, colors, lettering style, mounting provisions, and graphic features of identification products.

C. Identification Schedule: For each piece of electrical equipment and electrical system components to be index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 LABELS

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN PGDQ2 for components; including UL 969.

B. UL PGDQ2 - Vinyl Wraparound Labels: Preprinted, flexible labels laminated with clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

C. UL PGDQ2 - Self-Adhesive Wraparound Labels: Preprinted, 3 mil thick, vinyl flexible label with acrylic pressure-sensitive adhesive.

1. Self-Lamination: Clear; UV-, weather-, and chemical-resistant; self-laminating, with protective shield over legend. Size labels such that clear shield overlaps entire printed legend.
2. Marker for Labels:

    a. Permanent, waterproof, black ink marker recommended by tag manufacturer.
    b. Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

D. UL PGDQ2 - Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3 mil thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

1. Minimum Nominal Size:

    a. 1-1/2 by 6 inch for raceway and conductors.
    b. 3-1/2 by 5 inch for equipment.
    c. As required by authorities having jurisdiction.

2.2 EXTRUDED INSULATING TUBING

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN YDPU2 for components; including UL 224.

B. UL YDPU2 - Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at maximum of 200 deg F.

2.3 BANDS

A. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.

B. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeves, 2 inch long, with diameters sized to suit diameters and that stay in place by gripping action.

2.4 TAPES AND STENCILS

A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mil thick by 1 to 2 inch wide; compounded for outdoor use.

C. Floor Marking Tape: 2 inch wide, 5 mil pressure-sensitive vinyl tape, with yellow and black stripes and clear vinyl overlay.

D. Underground-Line Warning Tape:

1. Tape:

2. Color and Printing:

a. Comply with APWA Uniform Color Code using NEMA Z535.1 safety colors.
b. Inscriptions for Red Tapes: "CAUTION BURIED ELECTRIC LINE BELOW"
c. Inscriptions for Orange Tapes: "CAUTION BURIED COMMUNICATION LINE BELOW".

3. Detectable Line-Warning Tape:

a. Detectable three-layer laminate, consisting of printed pigmented polyolefin film, solid aluminum-foil core, and clear protective film that allows inspection of continuity of conductive core; bright colored, continuous-printed on one side with inscription of utility, compounded for direct-burial service.
b. Width: 3 inch
c. Overall Thickness: 5 mil
d. Foil Core Thickness: 0.35 mil
e. Weight: 28 lb/1000 sq. ft
f. Tensile in accordance with ASTM D882: 70 lbf and 4600 psi

E. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height must be 1 inch.

2.5 TAGS

A. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

B. Nonmetallic Preprinted Tags: Polyethylene tags, 0.023 inch thick, color-coded for phase and voltage level, with factory printed permanent designations; punched for use with self-locking cable tie fastener.

C. Write-on Tags:

1. Polyester Tags: 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment.
2. Marker for Tags:

a. Permanent, waterproof, black ink marker recommended by tag manufacturer.
b. Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.6 SIGNS

A. Baked-Enamel Signs:

1. Preprinted aluminum signs, high-intensity reflective, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4 inch grommets in corners for mounting.

3. Nominal Size: 7 by 10 inch.

B. Metal-Backed Butyrate Signs:

1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs, with 0.0396 inch galvanized-steel backing, punched and drilled for fasteners, and with colors, legend, and size required for application.
2. 1/4 inch grommets in corners for mounting.
3. Nominal Size: 10 by 14 inch.

C. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:

a. For signs up to 20 sq. inch, minimum 1/16 inch thick.
b. For signs larger than 20 sq. inch, 1/8 inch thick.
c. Engraved legend with black letters on white face.
d. Self-adhesive.
e. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

2.7 CABLE TIES

A. Performance Criteria:

1. Regulatory Requirements: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Listing Criteria: UL CCN ZODZ; including UL 1565 or UL 62275.

B. UL ZODZ - General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F in accordance with ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black, except where used for color-coding.

C. UL ZODZ - UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F in accordance with ASTM D638: 12,000 psi.
3. Temperature Range: Minus 40 to plus 185 deg F.
4. Color: Black.

D. UL ZODZ - Plenum-Rated Cable Ties: Self-extinguishing, UV stabilized, one piece, and self-locking.

1. Minimum Width: 3/16 inch.
2. Tensile Strength at 73 deg F in accordance with ASTM D638: 7000 psi.

3. UL 94 Flame Rating: 94V-0.
4. Temperature Range: Minus 50 to plus 284 deg F.
5. Color: Black.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 SELECTION OF COLORS AND IDENTIFICATION MARKINGS

A. Comply with 29 CFR 1910.144 for color identification of hazards, and the following:

1. Fire-protection and fire-alarm equipment, conduits, and ducts**,** boxes, must be finished, painted, or suitably marked in red finish color.
2. Emergency Systems, mass notification equipment, conduits, and ducts**,** boxes, must be finished, painted, or suitably marked in Orange finish color.
3. Telecommunications equipment, conduits, and ducts**,** boxes, must be finished, painted, or suitably marked in Blue finish color.
4. Ceiling-mounted hangers, supports, cable trays, and raceways must be finished, painted, or suitably marked safety yellow where less than 7.7 ft above finished floor.

B. Pipe and Conduit Labeling: Comply with ASME A13.1and IEEE C2.

C. Color-Coding for Phase- and Voltage-Level Identification, 1000 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.

1. Color must be factory applied or field applied for sizes larger than 6 AWG when permitted by authorities having jurisdiction.
2. Colors for 208Y/120 V Circuits:

   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.

3. Colors for 480Y/277 V Circuits:

   a. Phase A: Brown.
   b. Phase B: Orange.
   c. Phase C: Yellow.

4. Color for Neutral (Grounded Conductor): White.
5. Color for Equipment Ground: Bare copper, Green.
6. Color for Isolated Ground: Green with two or more yellow stripes.

D. Color-Coding Raceways, Cable Trays, Junction Boxes, and Conductors for Intrinsically-Safe Circuits: Light blue. When used to identify intrinsically-safe circuits, Article 504 of NFPA 70 requires that the color light blue not be used for any other purpose.

E. Color-Coding Instructional Signs: Self-adhesive labels, including color code for grounded and ungrounded conductors.

F. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:

1. "EMERGENCY POWER."
2. "POWER."
3. "COMMUNICATIONS."

G. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

H. Locations of Underground Lines: Underground-line detectable warning tape for power, lighting, communication, and control wiring and optical-fiber cable.

I. Handholes and Pull and Junction Boxes, More Than 1000 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use write-on tags, nonmetallic preprinted tags colored and marked to indicate phase, and separate tag with circuit designation.

J. Concealed Raceways, Duct Banks, More Than 1000 V, within Buildings: Tape and stencil. Stencil legend "DANGER - CONCEALED HIGH-VOLTAGE WIRING" with 3-inch high, black letters on 20 inch centers.

1. Locate identification at changes in direction, at penetrations of walls and floors, and at 10 ft maximum intervals.
2. Identify system voltage and system or service type with black letters on orange field.
3. Apply floor marking tape to the following finished surfaces:

a. Floor surface directly above conduits running beneath and within 12 inch of floor that is in contact with earth or is framed above unexcavated space.
b. Wall surfaces directly external to raceways concealed within wall.
c. Accessible surfaces of concrete envelope around raceways in vertical shafts, exposed in building, or concealed above suspended ceilings.

K. Accessible Raceways, Armored and Metal-Clad Cables, More Than 1000 V: Vinyl wraparound labels, Self-adhesive labels.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 25 ft maximum intervals in straight runs, and at 15 ft maximum intervals in congested areas.
2. Identify system voltage and system or service type with black letters on orange field.

L. Handholes and Pull and Junction Boxes, 1000 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use vinyl wraparound labels, self-adhesive wraparound labels to identify phase.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 25 ft (15 m) maximum intervals in straight runs, and at 15 ft maximum intervals in congested areas.
2. Identify system voltage and system or service type with black letters on orange field.

M. Accessible Raceways and Metal-Clad Cables, 1000 V or Less, Feeder, and Branch Circuits, More Than 30A and 120V to Ground: Identify with self-adhesive raceway labels, vinyl tape applied in bands.

1. Locate identification at changes in direction, at penetrations of walls and floors, at 25 ft maximum intervals in straight runs, and at 15 ft maximum intervals in congested areas.
2. Identify system voltage and system or service type with black letters on orange field.

N. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use write-on tags, self-adhesive labels with conductor or cable designation, origin, and destination.

O. Control-Circuit Conductor Termination Identification: For identification at terminations, provide heat-shrink preprinted tubes, self-adhesive labels with conductor designation.

P. Conductors to Be Extended in Future: Attach write-on tags to conductors and list source.

Q. Auxiliary Electrical Systems Conductor Identification: Marker tape that is uniform and consistent with system used by manufacturer for factory-installed connections.

R. Faceplates: Label individual faceplates with self-adhesive labels. Place label at top of faceplate. Each faceplate to be labeled with its individual, sequential designation, numbered clockwise when entering room from primary egress, composed of the following, in the order listed:

1. Wiring closet designation.
2. Colon.
3. Faceplate number.

S. Equipment Room Labeling:

1. Racks, Frames, and Enclosures: Identify front and rear of each with self-adhesive labels containing equipment designation.
2. Patch Panels: Label individual rows in each rack, starting at top and working down, with self-adhesive labels. Label individual rows and outlets, starting at to left and working down, with self-adhesive labels.
3. Data Outlets: Label each outlet with a self-adhesive label indicating the following, in the order listed:

    a. Room number being served.
    b. Colon.
    c. Faceplate number.

T. Backbone Cables: Label each cable with a vinyl-wraparound label, self-adhesive wraparound label indicating the location of the far or other end of the backbone cable. Patch panel or punch down block where cable is terminated should be labeled identically.

U. Horizontal Cables: Label each cable with a vinyl-wraparound label, self-adhesive wraparound label indicating the following, in the order listed:

1. Room number.
2. Colon.
3. Faceplate number.

V. Workspace Indication: Apply floor marking tape to finished surfaces. Show working clearances in direction of access to live parts. Workspace must comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

W. Equipment Identification Labels:

1. Black letters on white field.
2. Indoor Equipment: Self-adhesive label, Baked-enamel signs, Laminated acrylic or melamine plastic sign.
3. Outdoor Equipment: Laminated acrylic or melamine sign.
4. Equipment to Be Labeled:

    a. Panelboards: Typewritten directory of circuits in location provided by panelboard manufacturer. Panelboard identification must be in form of self-adhesive, engraved laminated acrylic or melamine label.
    b. Enclosures and electrical cabinets.
    c. Communications cabinets.
    d. Access doors and panels for concealed electrical items.
    e. Switchgear.
    f. Switchboards.
    g. Transformers: Label that includes tag designation indicated on Drawings for transformer, feeder, and panelboards or equipment supplied by secondary.
    h. Substations.
    i. Emergency system boxes and enclosures.
    j. Enclosed switches.
    k. Enclosed circuit breakers.
    l. Enclosed controllers.
    m. Variable-speed controllers.
    n. Push-button stations.
    o. Contactors.
    p. Remote-controlled switches, dimmer modules, and control devices.
    q. Uninterruptible power supplies.
    r. Power-generating units.
    s. Monitoring and control equipment.
    t. Computer room air conditioners.
    u. Fire-alarm and suppression equipment.
    v. Egress points.

3.3 SELECTION OF SIGNS AND HAZARD MARKINGS

A. Comply with 29 CFR 1910.145 for danger, caution, warning, and safety instruction signs.

B. Signs, labels, and tags required for personnel safety must comply with the following standards:

1. Safety Colors: NEMA Z535.1.
2. Facility Safety Signs: NEMA Z535.2.
3. Safety Symbols: NEMA Z535.3.
4. Product Safety Signs and Labels: NEMA Z535.4.
5. Safety Tags and Barricade Tapes for Temporary Hazards: NEMA Z535.5.

C. Electrical Hazard Warnings:

1. Arc-Flash Hazard Warning: Self-adhesive labels. Comply with NFPA 70E and Section 260573.19 "Arc-Flash Hazard Analysis" requirements for arc-flash hazard warning labels.
2. Raceways and Cables Carrying Circuits at More Than 1000 V:

   a. Black letters on orange field.
   b. Legend: "DANGER - CONCEALED HIGH VOLTAGE WIRING."

3. Multiple Power Sources Warning Legend: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
4. OSHA Workspace Clearance Warning Legend: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 3 FEET MINIMUM."

D. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.

1. Apply to exterior of door, cover, or other access.
2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

   a. Power-transfer switches.
   b. Controls with external control power connections.

E. Operating Instruction Signs: Self-adhesive labels, Laminated acrylic or melamine plastic signs.

3.4 INSTALLATION

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes typical for electrical equipment environments specified in Section 260011 "Facility Performance Requirements for Electrical."

C. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

D. Fasteners for Labels and Signs: Self-tapping, stainless steel screws or stainless steel machine screws with nuts and flat and lock washers.

E. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

F. Install identifying devices before installing acoustical ceilings and similar concealment.

G. Verify identity of item before installing identification products.

H. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

I. Apply identification devices to surfaces that require finish after completing finish work.

J. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

K. System Identification for Raceways and Cables under 1000 V: Identification must completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

L. System Identification for Raceways and Cables over 1000 V: Identification must completely encircle cable or conduit. Place adjacent identification of two-color markings in contact, side by side.

1. Secure tight to surface of conductor, cable, or raceway.

M. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

N. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from floor.

O. Vinyl Wraparound Labels:

1. Secure tight to surface of raceway or cable at location with high visibility and accessibility.
2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to location and substrate.

P. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.

Q. Self-Adhesive Labels:

1. Install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high label; where two lines of text are required, use labels 2 inch high.

R. Snap-Around Color-Coding Bands: Secure tight to surface at location with high visibility and accessibility.

S. Heat-Shrink, Preprinted Tubes: Secure tight to surface at location with high visibility and accessibility.

T. Marker Tapes: Secure tight to surface at location with high visibility and accessibility.

U. Self-Adhesive Vinyl Tape: Secure tight to surface at location with high visibility and accessibility.

1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for minimum distance of 6 inch where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

V. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

W. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's instructions.

X. Underground Line Detectable Warning Tape:

1. During backfilling of trenches, install continuous underground-line warning tape directly above cable or raceway at 12 inch above buried utility. Use multiple tapes where width of multiple lines installed in common trench or concrete envelope exceeds 16 inch overall.
2. Limit use of underground-line warning tape to direct-buried cables.
3. Install underground-line warning tape for direct-buried cables and cables in raceways.

Y. Metal Tags:

1. Place in location with high visibility and accessibility.
2. Secure using UV-stabilized cable ties.

Z. Nonmetallic Preprinted Tags:

1. Place in location with high visibility and accessibility.
2. Secure using UV-stabilized cable ties.

AA. Write-on Tags:

1. Place in location with high visibility and accessibility.
2. Secure using UV-stabilized cable ties.

BB. Baked-Enamel Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.
2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on minimum 1-1/2 inch high sign; where two lines of text are required, use signs minimum 2 inch high.
3. High sign; where two lines of text are required, use labels 2 inch high.

CC. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to location and substrate.

2. Unless otherwise indicated, provide single line of text with 1/2 inch high letters on 1-1/2 inch high sign; where two lines of text are required, use labels 2 inch high.

DD. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Indoors / Outdoors: UV-stabilized nylon.
2. In Spaces Handling Environmental Air: Plenum rated.

END OF SECTION 260553

SECTION 260573 - POWER SYSTEM STUDIES

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of this Section Includes:

1. Short-circuit study.
2. Overcurrent protective device coordination study.
3. Load-flow and voltage-drop study.
4. Motor-starting study.
5. Arc-flash hazard study.

1.2 ACTION SUBMITTALS

A. Product Data: For power system analysis software to be used for studies.

1. Product Certificates: For power system study software applications, include certificate stating compliance with specified requirements, signed by software manufacturer.

B. Power System Study Reports:

1. Submit reports after approval of system protective devices submittals. Submittals must be in digital and .pdf form.
2. Submit short-circuit study input data, including completed computer-program input data sheets.
3. Submit coordination study input data, including completed computer-program input data sheets.

   a. Submit load-flow, voltage-drop, and motor-starting data with coordination study.

4. Submit arc-flash study input data, including completed computer-program input data sheets.
5. Submit study report for action prior to receiving final approval of distribution equipment submittals. If formal completion of studies will cause delay in equipment manufacturing, obtain approval from Architect for preliminary submittal of sufficient study data to ensure that selection of devices and associated characteristics is satisfactory.
6. Submit revised one-line diagram, reflecting field investigation results and results of short-circuit study.

C. Data files for studies in format compatible with Owner's power system analysis software.

1.3 QUALITY ASSURANCE

A. Submittals for power system studies must be signed and sealed by qualified electrical professional engineer responsible for their preparation.

B. Studies must be performed using commercially developed and distributed software designed specifically for power system analysis.

C. Software algorithms must comply with requirements of standards and guides specified in this Section.

D. Manual calculations are unacceptable.

PART 2 - PRODUCTS

2.1 POWER SYSTEM ANALYSIS SOFTWARE

A. The Short Circuit Study, Coordination Study, and Arc Flash Calculations shall be performed using the latest released version of SKM Power Tools for Windows (PTW) software package, or approved equal EasyPower - Bently Systems

B. Standard Features:

1. Power System Analysis:

a. Power-systems-analysis software applications must have analytical capability to calculate "mandatory," "very desirable," and "desirable" features as listed in IEEE 3002 series standards.
b. Computer software application must be capable of plotting and diagramming time-current-characteristic curves as part of its output. Computer software program must report device settings and ratings of overcurrent protective devices and must demonstrate selective coordination by computer-generated, time-current coordination plots.
c. Computer software application must be designed to perform arc-flash analysis or have function, component, or add-on module designed to perform arc-flash analysis.

2. Analysis Standards:

a. Short-Circuit Current Analysis: In accordance with IEEE 3002.3.
b. Device Coordination Analysis: In accordance with IEEE 3004.3 and IEEE 3004.5.
c. Load-Flow Analysis: In accordance with IEEE 3002.2.
d. Motor-Starting Analysis: In accordance with IEEE 3002.7.
e. Harmonic Analysis: In accordance with IEEE 3002.8.
f. Transient Stability Analysis: In accordance with IEEE P3002.9.
g. Arc-Flash Hazard Analysis: In accordance with IEEE 1584.

3. Capable of printing arc-flash hazard warnings for equipment onvinyl, weather- and UV-resistant, pressure-sensitive adhesive labels complying with NFPA 70E.

   a. Label must have orange header with wording, "WARNING, ARC-FLASH HAZARD," and must include the following information taken directly from arc-flash hazard study:

      1) Equipment designation.
      2) Nominal voltage.
      3) Protection boundaries.

         a) Arc-flash boundary.
         b) Restricted approach boundary.
         c) Limited approach boundary.

      4) Arc-flash PPE category.
      5) Required minimum arc rating of PPE in Cal/cm squared.
      6) Available incident energy.
      7) Working distance.
      8) Engineering report number, revision number, and issue date.

C. Other Available Features Required by the Project:

1. Simultaneous faults.
2. Explicit negative sequence.
3. Mutual coupling in zero sequence.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Collect and analyze data for power system studies.

1. Verify completeness of data supplied in one-line diagram on Drawings. Call discrepancies to Architect's attention.
2. For equipment included as Work on the Project, use characteristics submitted under provisions of action submittals and information submittals for the Project.
3. For equipment that is existing to remain, obtain required electrical distribution system data by field investigation and surveys, conducted by qualified technicians and engineers in accordance with NFPA 70E.
4. Gather and tabulate required input data to support power system studies. Comply with requirements in Section 017839 "Project Record Documents" for recording circuit protective device characteristics. Record data on Record Document copy of one-line diagram. Comply with recommendations in IEEE 3002 series standards as to amount of detail that is required to be acquired in field. Field data gathering must be by, or under supervision of, qualified electrical professional engineer. Data include, but are not limited to, the following:

a. Product data for the Project's overcurrent protective devices involved in overcurrent protective device coordination studies. Use equipment designation tags that are consistent with electrical distribution system diagrams, overcurrent protective device submittals, input and output data, and recommended device settings.
b. Electrical power utility impedance at service.
c. Power sources and ties.
d. Short-circuit current at each system bus (three phase and line to ground).
e. Full-load current of loads.
f. Voltage level at each bus.
g. For transformers, include kVA, primary and secondary voltages, connection type, impedance, X/R ratio, taps measured in percent, and phase shift.
h. For reactors, provide manufacturer and model designation, voltage rating, and impedance.
i. For circuit breakers and fuses, provide manufacturer and model designation. List type of breaker, type of trip and available range of settings, SCCR, current rating, and breaker settings.
j. Generator short-circuit current contribution data, including short-circuit reactance, rated kVA, rated voltage, and X/R ratio.
k. For relays, provide manufacturer and model designation, current transformer ratios, potential transformer ratios, and relay settings.
l. Maximum demands from service meters.
m. Busway manufacturer and model designation, current rating, impedance, lengths, and conductor material.
n. Motor horsepower and NEMA MG 1 code letter designation.
o. Low-voltage cable sizes, lengths, number, conductor material, and conduit material (magnetic or nonmagnetic).
p. Medium-voltage cable sizes, lengths, conductor material, cable construction, metallic shield performance parameters, and conduit material (magnetic or nonmagnetic).
q. Derating factors.

3.2 PREPARATION

A. Preparation of Data for Short-Circuit Study:

1. Verify completeness of data supplied on one-line diagram. Call discrepancies to Architect's attention.
2. For equipment included as Work on the Project, use characteristics submitted under provisions of action submittals and information submittals for the Project.
3. Prepare one-line diagram of modeled power system, showing the following:

a. Protective device designations and ampere ratings.
b. Conductor types, sizes, and lengths.
c. Transformer kVA and voltage ratings.
d. Motor and generator designations and kVA ratings.

e. Switchgear, switchboard, motor-control center, and panelboard designations and ratings.
f. Derating factors and environmental conditions.
g. Revisions to electrical equipment required by study.

B. Preparation of Data for Overcurrent Protective Device Coordination Study:

1. Prepare data sheets to supplement electrical distribution system one-line diagram, cross-referenced with tag numbers on diagram, indicating the following:

   a. Special load considerations, including starting inrush currents and frequent starting and stopping.
   b. Transformer characteristics, including primary protective device, magnetic inrush current, and overload capability.
   c. Motor full-load current, locked rotor current, service factor, starting time, type of start, and thermal-damage curve.
   d. Generator thermal-damage curve.
   e. Ratings, types, and settings of utility company's overcurrent protective devices.
   f. Special overcurrent protective device settings or types stipulated by utility company.
   g. Time-current-characteristic curves of devices indicated to be coordinated.
   h. Manufacturer, frame size, interrupting rating in amperes root mean square (rms) symmetrical, ampere or current sensor rating, long-time adjustment range, short-time adjustment range, and instantaneous adjustment range for circuit breakers.
   i. Manufacturer and type, ampere-tap adjustment range, time-delay adjustment range, instantaneous attachment adjustment range, and current transformer ratio for overcurrent relays.
   j. Switchgear, switchboards, motor-control centers, and panelboards ampacity, and SCCR in amperes rms symmetrical.
   k. Identify series-rated interrupting devices for condition where available fault current is greater than interrupting rating of downstream equipment. Obtain device data details to allow verification that series application of these devices complies with NFPA 70 and UL 489 requirements.

2. Examine the Project's overcurrent protective device submittals for compliance with electrical distribution system coordination requirements and other conditions affecting performance of the Work. Devices to be coordinated are indicated on Drawings.
3. Proceed with coordination study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to coordination study may not be used in study.

C. Preparation of Data for Arc-Flash Hazard Study:

1. Assemble data from short-circuit study and overcurrent protective device coordination study.
2. Proceed with arc-flash study only after relevant equipment submittals have been assembled. Overcurrent protective devices that have not been submitted and approved prior to arc-flash study may not be used in study.

3.3 SHORT-CIRCUIT STUDY

A. Base study on device characteristics supplied by device manufacturer.

B. The entirety of electrical power system is to be studied, is indicated on Drawings, and as itemized below.

C. Begin short-circuit current analysis at service, extending down to system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 5 kA or less.

D. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for the Project. Study cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

E. Include AC fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase AC systems. Also account for fault-current DC decrement to address asymmetrical requirements of interrupting equipment.

F. Calculate short-circuit momentary and interrupting duties for three-phase bolted fault and single line-to-ground fault at equipment indicated on one-line diagram.

1. For grounded systems, provide bolted line-to-ground fault-current study for areas as defined for three-phase bolted fault short-circuit study.

G. Include in report identification of protective device applied outside its capacity.

3.4 OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY

A. Base study on device characteristics supplied by device manufacturer. When analysis of full range of device is impractical, limiting scope of analysis from 10 to 100 percent of device range is acceptable.

B. Extent of electrical power system to be studied is indicated on Drawings.

C. Begin analysis at service, extending down to system overcurrent protective devices as follows:

1. To normal system low-voltage load buses where fault current is 5 kA or less.

D. Study electrical distribution system from normal and alternate power sources throughout electrical distribution system for the Project. Study cases of system-switching configurations and alternate operations that could result in maximum fault conditions.

E. Transformer Primary Overcurrent Protective Devices:

1. Device must not operate in response to the following:

a. Inrush current when first energized.
b. Self-cooled, full-load current or forced-air-cooled, full-load current, whichever is specified for that transformer.
c. Permissible transformer overloads in accordance with IEEE C57.96 if required by unusual loading or emergency conditions.

2. Device settings must protect transformers in accordance with IEEE C57.12.00, for fault currents.

F. Motor Protection:

1. Select protection for low-voltage motors in accordance with IEEE 3004.8 and NFPA 70.
2. Select protection for motors served at voltages more than 600 V in accordance with IEEE 620.

G. Conductor Protection: Protect cables against damage from fault currents in accordance with ICEA P-32-382, ICEA P-45-482, and protection recommendations in IEEE 3004.7. Demonstrate that equipment withstands maximum short-circuit current for time equivalent to tripping time of primary relay protection or total clearing time of fuse. To determine temperatures that damage insulation, use curves from cable manufacturers or from listed standards indicating conductor size and short-circuit current.

H. Generator Protection: Select protection in accordance with manufacturer's published instructions and IEEE C37.102.

I. Include AC fault-current decay from induction motors, synchronous motors, and asynchronous generators and apply to low- and medium-voltage, three-phase AC systems. Also account for fault-current DC decrement, to address asymmetrical requirements of interrupting equipment.

J. Include coordination of ground-fault protection devices.

K. Calculate short-circuit momentary and interrupting duties for three-phase bolted fault and single line-to-ground fault at equipment indicated on one-line diagram.

1. For grounded systems, provide bolted line-to-ground fault-current study for areas as defined for three-phase bolted fault short-circuit study.

L. Protective Device Evaluation:

1. Evaluate equipment and protective devices and compare to short-circuit ratings.
2. Adequacy of switchgear, motor-control centers, and panelboard bus bars to withstand short-circuit stresses.
3. Application of series-rated devices must be recertified, complying with requirements in NFPA 70.
4. Include in report identification of protective device applied outside its capacity.

3.5 LOAD-FLOW AND VOLTAGE-DROP STUDY

A. Perform load-flow and voltage-drop study to determine steady-state loading profile of system. Analyze power system performance two times as follows:

1. Determine load flow and voltage drop based on full-load currents.
2. Determine load flow and voltage drop based on 80 percent of design capacity of load buses.
3. Prepare load-flow and voltage-drop analysis and report to show power system components that are overloaded or might become overloaded; show bus voltages that are less than as prescribed by NFPA 70.

3.6 MOTOR-STARTING STUDY

A. Perform motor-starting study to analyze transient effect of system's voltage profile during motor starting. Calculate significant motor-starting voltage profiles and analyze effects of motor starting on power system stability.

B. Prepare motor-starting study report, noting light flicker for limits proposed by IEEE 1453, and voltage sags so as not to affect operation of other utilization equipment on system supplying motor.

3.7 ARC-FLASH HAZARD STUDY

A. Comply with NFPA 70E, including Annex D, for arc-flash hazard study.

B. Preparatory Studies: Obtain short-circuit study and overcurrent protective device coordination study results prior to starting arc-flash hazard study.

C. Calculate maximum and minimum contributions of fault-current size.

1. Maximum calculation must assume maximum contribution from utility and must assume motors to be operating under full-load conditions.
2. Calculate arc-flash energy at 85 percent of maximum short-circuit current in accordance with IEEE 1584 recommendations.
3. Calculate arc-flash energy at 38 percent of maximum short-circuit current in accordance with NFPA 70E recommendations.
4. Calculate arc-flash energy with utility contribution at minimum and assume no motor contribution.

D. Calculate arc-flash protection boundary and incident energy at locations in electrical distribution system where personnel could perform work on energized parts.

E. Include medium- and low-voltage equipment locations , except nominal arc-flash hazard warning data may be provided for equipment fed from transformers rated below 240 V(ac), 2000 A, instead of documenting precise calculations.

F. Calculate limited, restricted, and prohibited approach boundaries for each location.

G. Incident energy calculations must consider accumulation of energy over time when performing arc-flash calculations on buses with multiple sources. Iterative calculations must account for changing current contributions, as sources are interrupted or decremented with time. Fault contribution from motors and generators must be decremented as follows:

1. Fault contribution from induction motors must not be considered beyond three to five cycles.
2. Fault contribution from synchronous motors and generators must be decayed to match actual decrement of each as closely as possible (for example, contributions from permanent magnet generators will typically decay from 10 to 3 p.u. after 10 cycles).

H. Arc-flash energy must generally be reported for maximum of line or load side of circuit breaker. However, arc-flash computation must be performed and reported for both line and load side of circuit breaker as follows:

1. When circuit breaker is in separate enclosure.
2. When line terminals of circuit breaker are separate from work location.

I. Base arc-flash calculations on actual overcurrent protective device clearing time. Cap maximum clearing time at two seconds based on IEEE 1584, Section B.1.2.

3.8 POWER SYSTEM STUDY REPORTS

A. Preparation of Power System Study Reports: Prepare and submit the following:

1. Short-Circuit Study Report Contents:

a. Executive summary of study findings.
b. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
c. One-line diagram of modeled power system, showing the following:

1) Protective device designations and ampere ratings.
2) Conductor types, sizes, and lengths.
3) Transformer kVA and voltage ratings.
4) Motor and generator designations and kVA ratings.
5) Switchgear, switchboard, motor-control center, and panelboard designations and ratings.
6) Derating factors and environmental conditions.
7) Revisions to electrical equipment required by study.

d. Comments and recommendations for system improvements or revisions in written document, separate from one-line diagram.
e. Short-Circuit Study Input Data:

1) One-line diagram of system being studied.

2) Power sources available.
3) Manufacturer, model, and interrupting rating of protective devices.
4) Conductors.
5) Transformer data.

f. Protective Device Evaluation:

1) Evaluate equipment and protective devices and compare to available short-circuit currents. Verify that equipment withstand ratings exceed available short-circuit current at equipment installation locations.
2) Tabulations of circuit breaker, fuse, and other protective device ratings versus calculated short-circuit duties.
3) For 600 V overcurrent protective devices, ensure that interrupting ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.
4) For devices and equipment rated for asymmetrical fault current, apply multiplication factors listed in standards to 1/2-cycle symmetrical fault current.
5) Verify adequacy of phase conductors at maximum three-phase bolted fault currents; verify adequacy of equipment grounding conductors and grounding electrode conductors at maximum ground-fault currents. Ensure that short-circuit withstand ratings are equal to or higher than calculated 1/2-cycle symmetrical fault current.

g. Short-Circuit Study Output Reports:

1) Low-Voltage Fault Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a) Voltage.
b) Calculated fault-current magnitude and angle.
c) Fault-point X/R ratio.
d) Equivalent impedance.

2) Momentary Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a) Voltage.
b) Calculated symmetrical fault-current magnitude and angle.
c) Fault-point X/R ratio.
d) Calculated asymmetrical fault currents based on fault-point X/R ratio; based on calculated symmetrical value multiplied by 1.6; and based on calculated symmetrical value multiplied by 2.7.

3) Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each overcurrent device location:

a) Voltage.
b) Calculated symmetrical fault-current magnitude and angle.

c) Fault-point X/R ratio.
d) No AC Decrement (NACD) ratio.
e) Equivalent impedance.
f) Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on symmetrical basis.
g) Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on total basis.

2. Overcurrent Protection Device Coordination Study Report Contents:

a. Executive summary of study findings.
b. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
c. One-line diagram of modeled power system, showing the following:

1) Protective device designations and ampere ratings.
2) Conductor types, sizes, and lengths.
3) Transformer kVA and voltage ratings.
4) Motor and generator designations and kVA ratings.
5) Switchgear, switchboard, motor-control center, and panelboard designations.
6) Revisions to electrical equipment required by study.

d. Report recommended settings of protective devices, ready to be applied in field. Use manufacturer's data sheets for recording recommended setting of overcurrent protective devices when available.

1) Phase and Ground Relays:

a) Device tag.
b) Relay current transformer ratio and tap, time dial, and instantaneous pickup value.
c) Recommendations on improved relaying systems, if applicable.

2) Circuit Breakers:

a) Adjustable pickups and time delays (long time, short time, and ground).
b) Adjustable time-current characteristic.
c) Adjustable instantaneous pickup.
d) Recommendations on improved trip systems, if applicable.

3) Fuses: Show current rating, voltage, and class.

e. Time-Current Coordination Curves: Determine settings of overcurrent protective devices to achieve selective coordination. Graphically illustrate that adequate time separation exists between devices installed in series, including power utility company's upstream devices. Prepare separate sets of curves for switching schemes

and for emergency periods where power source is local generation. Show the following information:

1) Device tag and title, one-line diagram with legend identifying portion of system covered.
2) Terminate device characteristic curves at point reflecting maximum symmetrical or asymmetrical fault current to which device is exposed.
3) Identify device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.
4) Plot the following listed characteristic curves, as applicable:

    a) Power utility's overcurrent protective device.
    b) Medium-voltage equipment overcurrent relays.
    c) Medium- and low-voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands.
    d) Low-voltage equipment circuit-breaker trip devices, including manufacturer's tolerance bands.
    e) Transformer full-load current, magnetizing inrush current, and ANSI through-fault protection curves.
    f) Cables and conductors damage curves.
    g) Ground-fault protective devices.
    h) Motor-starting characteristics and motor damage points.
    i) Generator short-circuit decrement curve and generator damage point.
    j) Largest feeder circuit breaker in each motor-control center and panelboard.

5) Maintain selectivity for tripping currents caused by overloads.
6) Maintain maximum achievable selectivity for tripping currents caused by overloads on series-rated devices.
7) Provide adequate time margins between device characteristics such that selective operation is achieved.
8) Comments and recommendations for system improvements.

3. Arc-Flash Hazard Study Report Contents:

    a. Executive summary of study findings.
    b. Study descriptions, purpose, basis, and scope. Include case descriptions, definition of terms, and guide for interpretation of results.
    c. One-line diagram, showing the following:

        1) Protective device designations and ampere ratings.
        2) Conductor types, sizes, and lengths.
        3) Transformer kVA and voltage ratings, including derating factors and environmental conditions.
        4) Motor and generator designations and kVA ratings.
        5) Switchgear, switchboard, motor-control center, panelboard designations, and ratings.

d. Short-circuit study output data.
e. Overcurrent protective device coordination study report contents.
f. Arc-Flash Study Output Reports:

1) Interrupting Duty Report: Three-phase and unbalanced fault calculations, showing the following for each equipment location included in report:

a) Voltage.
b) Calculated symmetrical fault-current magnitude and angle.
c) Fault-point X/R ratio.
d) No AC Decrement (NACD) ratio.
e) Equivalent impedance.
f) Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on symmetrical basis.
g) Multiplying factors for 2-, 3-, 5-, and 8-cycle circuit breakers rated on total basis.

g. Incident Energy and Flash Protection Boundary Calculations:

1) Arcing fault magnitude.
2) Protective device clearing time.
3) Duration of arc.
4) Arc-flash boundary.
5) Restricted approach boundary.
6) Limited approach boundary.
7) Working distance.
8) Incident energy.
9) Hazard risk category.
10) Recommendations for arc-flash energy reduction.

h. Fault study input data, case descriptions, and fault-current calculations including definition of terms and guide for interpretation of computer printout.

3.9 FIELD ADJUSTMENT FOR DEVICE COORDINATION

A. Adjust relay and protective device settings in accordance with recommended settings provided by coordination study. Field adjustments must be completed by engineering service division of equipment manufacturer under "Startup and Acceptance Testing" contract portion.

B. Make minor modifications to equipment and over-current protection settings as required to accomplish compliance with short-circuit and protective device coordination studies.

C. Testing and adjusting must be by qualified medium-voltage and low-voltage electrical testing and inspecting agency.

1. Perform each visual and mechanical inspection and electrical test stated in NETA ATS. Certify compliance with test parameters. Perform NETA tests and inspections for adjustable overcurrent protective devices.

3.10 WARNING LABELING OF ARC-FLASH HAZARDS

A. Apply one arc-flash label on front cover of each section of equipment for each equipment included in study, including each piece of equipment listed below:

1. Medium-voltage switchgear.
2. Medium-voltage switches.
3. Medium voltage transformers.
4. Low-voltage switchgear.
5. Switchboards.
6. Panelboards.
7. Motor-control centers.
8. Low voltage transformers.
9. Safety switches.
10. Control panels.
11. Transfer Switches.

B. Base arc-flash label data on highest values calculated at each location.

C. Machine print warning labels with no handwritten or field-applied markings.

D. Install arc-flash warning labels under direct supervision and control of qualified electrical professional engineer.

E. Indicate on record Drawings location of equipment where personnel could be exposed to arc-flash hazard during their work.

1. Indicate arc-flash energy.
2. Indicate protection level required.

END OF SECTION 260573

SECTION 26 08 00 - COMMISSIONING OF ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SYSTEMS TO BE COMMISSIONED

A. The following systems will be commissioned in this project. The Owner and the CxA reserves the right to amend this list at any time during the construction and acceptance process.

Electrical

1. Lighting and Lighting Controls
2. Electrical Metering System

1.2 RELATED WORK

A. Specific commissioning requirements are given in the following sections of these specifications. All of the following sections apply to the Work of this section. General specifications for commissioning responsibilities, abbreviation definitions, and reporting requirements are provided in the following sections:

Section 019113 – General Commissioning Requirements

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 FUNCTIONAL TESTING SUPPORT REQUIREMENTS

A. General Requirements

1. This section provides brief descriptions of the testing and support the PC will be required to provide to perform the functional testing of the equipment for the project.
2. A functional performance test shall be performed on each complete system. Each function shall be demonstrated to the satisfaction of the CxA based on the written test procedure developed by the CxA to demonstrate conformance to the requirements of the Contract Documents.
3. Each functional performance test shall be performed, witnessed and signed off by the CxA. The PC will be responsible for providing the required support and representation during this testing. Any exceptions to this will be made clear to the Owner as to the reason and justification.
4. The functional performance testing shall be conducted in accordance with prior approved procedures and documented as required.

B. Lighting and Lighting Controls

1. Light fixtures will be verified that they are the proper fixture and the proper installation requirements have been adhered to by the installing contractor.
2. The contractor is expected to test and verify the operation of every light. The CxA will sample approximately 25% of this system.
3. All occupancy sensors will be tested for sensitivity and duration of “on period” after area has been vacated.
4. All switches will be tested for operation, including the operation of multiple 3-way switches.
5. All time clocks will be tested for operation of the programmable time schedule.
6. Web accessible interface for the lighting control system software will be demonstrated to the CxA. All scene and dimming control will be verified.
7. All graphics, programming and reports will be completed and functionality demonstrated to the CxA.
8. The contractor is expected to test and verify the operation of every occupancy sensor, light switch, photocell, and time clock. The CxA will sample approximately 25% of this system.

C. Electrical Metering System

1. The contractor will provide an as-built document detailing the sub-meter, connectivity point, and the loads that are associated with the meter.
2. The actual load will be verified with an amp-meter to confirm that the meter is reading properly and any multipliers are programmed properly.
3. The integration to the BMS or any other third-party software platform will be verified. The contractor is expected to test and verify the operation of every occupancy sensor, light switch, photocell, and time clock. The CxA will sample approximately 25% of this system.

END OF SECTION 26 08 00

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Electronic time switches.
2. Electromechanical dial-time switches.
3. Outdoor photoelectric switches, solid state, flexible mounting.
4. Outdoor photoelectric switches, low voltage.
5. Indoor occupancy and vacancy sensors.
6. Switchbox-mounted occupancy sensors.
7. Digital timer light switch.
8. Outdoor motion sensors.
9. Lighting contactors.
10. Conductors and cables.

1.2 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

B. Shop Drawings:

1. Show installation details for the following:

   a. Occupancy sensors.
   b. Vacancy sensors.

2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

C. Field quality-control reports.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For manufacturer's warranties.

1.4 WARRANTY

A. Special Extended Warranty: Manufacturer and Installer warrant that installed lighting control devices perform in accordance with specified requirements and agree to repair or replace, including labor, materials, and equipment, devices that fail to perform as specified within extended warranty period.

1. Failures include, but are not limited to, the following:

a. Faulty operation of lighting control software.
b. Faulty operation of lighting control devices.

2. Extended Warranty Period: Four (4) year(s) from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 ELECTRONIC TIME SWITCHES

A. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.

1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application. DPST.
2. Contact Rating: 20 A driver load, 120/240 V(ac).
3. Programs:
   a. Four channels; each channel is individually programmable with 40 on-off operations per week and an annual holiday schedule that overrides the weekly operation on holidays.

   b. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program on selected channels.
4. Astronomic Time: All channels.
5. Automatic daylight savings time changeover.
6. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

2.2 ELECTROMECHANICAL DIAL-TIME SWITCHES

A. Electromechanical-Dial Time Switches: Comply with UL 917.

1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Contact Configuration: SPST.
3. Contact Rating: 20 A driver load, 120/240 V(ac).

4. Circuitry: Allows connection of a photoelectric relay as a substitute for the on-off function of a program.
5. Astronomic time dial.
6. Eight-Day Program: Uniquely programmable for each weekday and holidays.
7. Skip-a-day mode.
8. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16> hours.

2.3 OUTDOOR PHOTOELECTRIC SWITCHES, LOW VOLTAGE

A. Description: Solid state; one set of NO dry contacts rated for 24 V(dc) at 1 A, to operate connected load, complying with UL 773, and compatible with luminaire, power pack.

1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
3. Time Delay: Thirty-second minimum, to prevent false operation.
4. Mounting: 1/2 inch threaded male conduit.
5. Failure Mode: Luminaire stays ON.
6. Power Pack:

   a. Dry contacts rated for 20 A LED load at 120 and 277 V(ac), for 13 A at 120 V(ac). Sensor has 24 V(dc), 150 mA, Class 2 power source.

      1) LED status lights to indicate load status.
      2) Plenum rated.

   b. Digital controller capable of accepting four 8PSJ inputs with two outputs rated for 20 A LED load at 120 and 277 V(ac), for 16 LED at 120 and 277 V(ac), and for at 120 V(ac). Sensor has 24 V(dc), Class 2 power source.

      1) With integral current monitoring.
      2) Compatible with digital addressable lighting interface.
      3) Plenum rated.

2.4 INDOOR OCCUPANCY AND VACANCY SENSORS

A. General Requirements for Sensors:

1. Ceiling mounted, solid-state indoor occupancy and vacancy sensors.
2. Passive infrared, Ultrasonic, or Dual technology.
3. Separate power pack.
4. Hardwired or Wireless connection to switch BAS and lighting control system.

5. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.
6. Operation:

    a. Occupancy Sensor: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
    b. Vacancy Sensor: Unless otherwise indicated, lights are manually turned on and sensor turns lights off when the room is unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
    c. Combination Sensor: Unless otherwise indicated, sensor must be programmed to turn lights on when coverage area is occupied and turn them off when unoccupied, or to turn off lights that have been manually turned on; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

7. Sensor Output: Sensor is powered from the power pack, Wireless.
8. Power: Line voltage.
9. Power Pack: Dry contacts rated for 20 A LED load at 120 and 277 V(ac), for 13 A tungsten at 120 V(ac), and for 1 hp at 120 V(ac). Sensor has 24 V(dc), 150 mA, Class 2 power source.
10. Mounting:

    a. Sensor: Suitable for mounting in any position in a standard device box or outlet box.
    b. Relay: Externally mounted through a 1/2 inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

11. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
12. Bypass Switch: Override the "on" function in case of sensor failure.
13. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; turn lights off when selected lighting level is present.

B. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.

1. Detector Sensitivity: Detect occurrences of 6 inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. inch.
2. Detection Coverage (Room, Ceiling Mounted): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96 inch high ceiling.

C. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.

1. Detector Sensitivity: Detect a person of average size and weight moving not less than 12 inch in either a horizontal or a vertical manner at an approximate speed of 12 inch/s.

2. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96 inch (2440 mm) high ceiling.
3. Detection Coverage (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. when mounted on a 96 inch high ceiling.
4. Detection Coverage (Corridor): Detect occupancy anywhere within 90 ft. when mounted on a 10 ft. (3 m) high ceiling in a corridor not wider than 14 ft.
5. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 1000 sq. ft. when mounted 84 inch above finished floor.

D. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6 inch minimum movement of any portion of a human body that presents a target of not less than 36 sq. inch, and detect a person of average size and weight moving not less than 12 inch in either a horizontal or a vertical manner at an approximate speed of 12 inch/s.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96 inch high ceiling.
4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of 2000 sq. ft. when mounted 48 inch above finished floor.

2.5 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox, with provisions for connection to BAS using hardwired connection or using wireless connection.

1. Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
4. Switch Rating: Not less than 800 VA LED load at 120 V, 1200 VA LED load at 277 V, and 800 W incandescent.

B. Wall-Switch Sensor:

1. Standard Range: 210-degree field of view, with a minimum coverage area of 900 sq. ft.
2. Sensing Technology: PIR.
3. Switch Type: SP, field-selectable automatic "on," or manual "on," automatic "off."
4. Capable of controlling load in three-way application.

5. Voltage: Dual voltage, 120 and 277 V.
6. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
7. Concealed, "off" time-delay selector at 30 seconds and 5, 10, and 20 minutes.
8. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
9. Color: Gray.
10. Faceplate: Color matched to switch.

2.6 LIGHTING CONTACTORS

A. Description: Electrically operated and electrically held, combination-type lighting contactors with non-fused disconnect, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less THD of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as scheduled, matching the NEMA type specified for the enclosure.

2.7 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 16 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION OF SENSORS

A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

B. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's instructions.

3.2 INSTALLATION OF CONTACTORS

A. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3 INSTALLATION OF WIRING

A. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 3/4 inch.

B. Wiring within Enclosures: Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's instructions.

C. Size conductors in accordance with lighting control device manufacturer's instructions unless otherwise indicated.

D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, device, and outlet boxes; terminal cabinets; and equipment enclosures.

3.4 IDENTIFICATION

A. Identify components and power and control wiring in accordance with Section 260553 "Identification for Electrical Systems.

B. Label time switches and contactors with a unique designation.

3.5 FIELD QUALITY CONTROL

A. Field tests must be witnessed by Campus Representative.

B. Tests and Inspections:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Nonconforming Work:

1. Lighting control devices will be considered defective if they do not pass tests and inspections.

2. Remove and replace defective units and retest.

D. Prepare test and inspection reports.

E. Manufacturer Services:

1. Engage factory-authorized service representative to support and supervise field tests and inspections.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within **12** months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions. Provide up to three visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

END OF SECTION 260923

SECTION 261213 – LIQUID-FILLED MEDIUM VOLTAGE TRANSFORMER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Liquid-filled, medium-voltage substation transformers, with primary and secondary bushings within or without air-terminal enclosures.
2. Control network.
3. Warning labels and signs.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at SUNY New Paltz – Peregrine Dinning Hall..

B. Preinstallation Coordination Meeting(s): For liquid-filled, medium-voltage transformers. Conduct meeting at ConstructionManager's Trailer, on site. prior to start of construction.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

B. Shop Drawings:

1. For liquid-filled, medium-voltage transformers.

a. Include plans and elevations showing major components and features.

1) Include plan view and cross section of equipment base, showing clearances, manufacturer's recommended workspace, and locations of penetrations for grounding and conduits.

b. Include details of equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of field connections.
c. Include single-line diagram.
d. Include list of materials.
e. Include nameplate legends.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For transformers, signed by product manufacturer.

B. Source quality-control reports.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Maddox, or approved equal by:

1. Larson Electronics.
2. Square D.
3. Eaton

2.2 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction, and marked for intended location and application.

B. Comply with IEEE C2.

C. Comply with IEEE C57.12.00.

2.3 PERFORMANCE REQUIREMENTS

A. Windings Material: Aluminum.

B. Surge Arresters: Comply with IEEE C62.11, Distribution Class; metal-oxide-varistor type, connected in each phase of incoming circuit and ahead of disconnecting device.

C. Winding Connections: Connection of windings and terminal markings must comply with IEEE C57.12.70.

D. Efficiency: Comply with 10 CFR 431, Subpart K.

E. Insulation:

1. Transformer 2,500 kVA Rating, when indicated at 65 deg C Rise**,** Must Be as Follows: Average winding temperature rise above ambient temperature must not exceed 65 deg C and 80 deg C hottest-spot temperature rise at rated kVA when tested in accordance with IEEE C57.12.90, using combination of connections and taps that give highest average winding temperature rise.

F. Bushings must comply with IEEE C57.19.01 requirements for impulse and low-frequency insulation levels.

G. Tap Changer: External, for de-energized operation.

H. Mounting: Integral skid mounting frame, suitable to allow skidding or rolling of transformer in any direction, and with provision for anchoring frame to pad.

I. Insulating Liquids:

1. Mineral Oil: ASTM D3487, Type II, and tested for compliance with ASTM D117.

J. Capacities and Characteristics:

1. Location: Outdoors.
2. Additional Standards: Comply with IEEE C57.12.10.
   a. Comply with UL 1062 listing requirements.
   b. Comply with UL listing requirements for combination classification and listing for transformer and less-flammable insulating liquid.
3. Connections:
   a. Primary: Air-filled terminal cabinet for cable connection.
   b. Secondary: Air-filled terminal cabinet for cable connection.
4. Transformer Ratings. Comply with IEEE C57.12.00 for cooling class.
   a. Self-Cooled Rating, Class KNAN: 3,750 kVA.
   b. Impedance: Not less than 5.75 > percent.
   c. Temperature Rise: [55/65 deg C.
   d. Coils Connection:
      1) Line-Side Winding: Delta.
      2) Load-Side Winding: Wye.
   e. Voltage and BIL Ratings:
      1) Nominal primary phase-to-phase voltage and BIL: 13 800 V, 95 kV.
      2) Nominal secondary voltage and BIL: 480Y/277 V, 45 kV
5. Finish:
   a. Outdoor Transformer Enclosure Finish: Factory-applied finish in manufacturer's standard color, corrosion resistance complying with IEEE C57.12.28.

b. Special Corrosion-Resistant Enclosure Finish: Factory-applied, corrosion-resistant finish in manufacturer's standard color that withstands 480 hours of exposure to salt-spray test specified in ASTM B117 without loss of paint or release of adhesion of paint primer coat to metal surface in excess of 1/16 inch from test mark. Scribed test mark and test evaluation must be in accordance with ASTM D1654 with rating of not less than 7, in accordance with Table 1 (Procedure A). Cut edges or otherwise damaged surfaces of hot-dip galvanized sheet steel, or mill-galvanized sheet steel must be coated with manufacturer's standard zinc-rich paint.

6. Taps: Two 2-1/2 percent, full-capacity taps above, and two 2-1/2 percent, full-capacity taps below rated voltage. Comply with IEEE C57.12.36 requirements.

7. Transformer Accessories:

a. Drain and filter connection.
b. Filling and top filter press connections.
c. Pressure-vacuum gauge.
d. Dial-type analog thermometer with alarm contacts.
e. Magnetic liquid level indicator with high and low alarm contacts.
f. Pressure-relief device set to operate at 10 psig, plus or minus 2 psig, and then automatically reseal when pressure drops to 6 psig minimum. Device flow must be as recommended by manufacturer. With alarm contacts and manual bleeder.
g. At least four stainless steel ground connection pads.
h. Provisions for jacking, lifting, and towing.
i. Machine-engraved nameplate made of anodized aluminum or stainless steel.
j. Sudden pressure relay for remote alarm or trip when internal transformer pressure rises at field-set rate. Provide with seal-in delay.

2.4 CONTROL NETWORK

A. Controllers: Support serial MS/TP and Ethernet IP communications, and able to communicate directly via RS-485 serial networks and Ethernet 10Base-T networks as native device.

2.5 WARNING LABELS AND SIGNS

A. Comply with requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."

1. Warning signs must be made of baked enamel.
2. Equipment Identification Labels: Engraved, laminated-acrylic or -melamine label.

2.6 SOURCE QUALITY CONTROL

A. Factory Tests and Inspections: Perform the following tests and inspections on liquid-filled, medium-voltage transformer, by, or under supervision of, qualified electrical testing laboratory recognized by authorities having jurisdiction, before delivering to site. Affix label with name and date of manufacturer's certification of system compliance on control units.

1. Resistance.

2. Turns ratio, polarity, and phase relation.
3. Transformer no-load losses and excitation current at 100 percent of ratings.
4. Transformer impedance voltage and load loss.
5. Operation of devices.
6. Control (auxiliary) and consumption losses.
7. Lightning impulse.
8. Low frequency.
9. Leak.

B. Nonconforming Work:

1. System equipment that does not pass tests and inspections will be considered defective.

C. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Handling:

1. Handle transformers carefully, in accordance with manufacturer recommendations, to avoid damage to enclosure, termination compartments, base, frame, tank, and internal components. Do not subject transformers to impact, jolting, jarring, or rough handling.
2. Protect transformer termination compartments against entrance of dust, rain, and snow.
3. Transport transformers upright, to avoid internal stresses on core and coil mounting assembly and to prevent trapping air in windings. Do not tilt or tip transformers.

B. Examine areas and space conditions for compliance with requirements for liquid-filled, medium-voltage transformers and other conditions affecting performance of the Work.

C. Examine roughing-in of conduits and grounding systems to verify the following:

1. Wiring entries comply with layout requirements.
2. Entries are within conduit-entry tolerances specified by manufacturer, and no feeders will cross section barriers to reach load or line lugs.

D. Verify that ground connections are in place and that requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance must be 5 Ω at transformer location.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with requirements for equipment bases and foundations specified in Section 260529 "Hangers and Supports for Electrical Systems."

B. Transformer must be installed level and plumb and must tilt less than 1.5 degrees while energized.

C. Comply with requirements for vibration isolation and seismic control devices specified in Section 260529 "Hangers and Supports for Electrical Systems".

D. Maintain minimum clearances and workspace at equipment in accordance with manufacturer's written instructions and NFPA 70.

3.3 CONNECTIONS

A. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

1. At Interior Locations: For grounding-to-grounding electrodes, use bare copper cable not smaller than 4/0 AWG. Bond surge arrester and neutrals directly to transformer enclosure and then to grounding electrode system with bare copper conductors. Keep leads as short as practicable, with no kinks or sharp bends. Make joints in grounding conductors and loops by exothermic weld or compression connector.

2. At Exterior Locations:

   a. For counterpoise, use tinned bare copper cable not smaller than 4/0 AWG, buried not less than 30 inch below grade interconnecting grounding electrodes. Bond surge arrester and neutrals directly to transformer enclosure and then to grounding electrode system with bare copper conductors. Keep lead lengths as short as practicable, with no kinks or sharp bends.
   b. Fence and equipment connections must not be smaller than 4 AWG. Ground fence at gate post and corner post and at intervals not exceeding 10 ft. Bond gate section to fence post using 1/8 by 1 inch tinned flexible braided copper strap and clamps.
   c. Make joints in grounding conductors and loops by exothermic weld or compression connector.

3. Terminate grounding and bonding conductors on common equipment grounding terminal on transformer enclosure. Install supplemental terminal bars, lugs, and bonding jumpers as required to accommodate number of conductors for termination.
4. Complete transformer tank grounding and lightning arrester connections prior to making other electrical connections.

B. Terminate medium-voltage cables in incoming section of substations in accordance with Section 260513 "Medium-Voltage Cables."

3.4 SIGNS AND LABELS

A. Comply with installation requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."

B. Install warning signs as required to comply with 29 CFR 1910.269.

3.5 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

B. Field tests and inspections must be witnessed by Campus Representative.

C. Tests and Inspections:

1. General Field-Testing Requirements:

a. Comply with provisions of "Testing and Test Methods" Chapter in NFPA 70B.
b. After installing transformer but before primary is energized, verify that grounding system at substation is tested at specified value or less.

D. Nonconforming Work:

1. Equipment and devices will be considered defective if they do not pass tests and inspections.
2. Remove and replace malfunctioning units and retest.

E. Assemble and submit test and inspection reports. Record as-left set points of adjustable devices.

F. Manufacturer Services:

1. Engage factory-authorized service representative to support and supervise field tests and inspections.

END OF SECTION 261213

SECTION 261326 - MEDIUM-VOLTAGE METAL-CLAD SWITCHGEAR

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes metal-clad switchgear.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For each medium-voltage, metal-clad switchgear.

1. Include a tabulation of installed devices with features and ratings.
2. Include dimensioned plans and elevations, showing dimensions, shipping sections, and weights of each assembled section. Elevations must show major components, features, and mimic bus diagram.
3. Include a plan view and cross section of equipment base showing clearances, manufacturer's recommended workspace, and locations of penetrations for grounding and conduits. Show location of anchor bolts and leveling channels.
4. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, and location and size of each field connection.
5. Locate accessory and spare equipment storage.
6. Include single-line diagram.
7. Include control power wiring diagrams.
8. Include copy of nameplate.
9. Test results of enclosure corrosion resistant finish.
10. Ratings the switchgear assembly:
    a. Voltage.
    b. Continuous current.
    c. Short-circuit current.
    d. Lightning impulse full-wave withstand voltage.
11. Utility company's metering provisions with indication of approval by utility company.
12. Design Calculations: Signed and sealed by a qualified structural professional engineer. Calculate requirements for selecting seismic restraints.
13. Relay settings.
14. Interface data with monitoring or control network.
15. Wiring Diagrams: For each switchgear assembly include the following:
    a. Power, signal, and control wiring.
    b. Three-line diagrams of current and future secondary circuits showing device terminal numbers and internal diagrams.

c. Schematic control diagrams.
d. Diagrams showing connections of component devices and equipment.
e. Schematic diagrams showing connections to remote devices including connection details to the communications network.
f. Layout – coordination drawings.

1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Source quality-control reports.

C. Field quality-control reports.

1.4 WARRANTY

A. Special Battery Warranties: Manufacturer and Installer agree to repair or replace the switchgear control system storage batteries that fail in materials or workmanship within specified warranty period.

1. Warranted Cycle Life for Premium VRLA Batteries: Equal to or greater than that represented in manufacturer's published table, including figures corresponding to the following, based on annual average battery temperature of 77 deg F:

a. For discharge rate not faster than eight hours, discharge duration not longer than eight hours, and voltage at end of discharge not less than 1.67 V, warranted life must be not fewer than 40 discharge cycles.
b. For discharge rate not faster than 30 minutes, discharge duration not longer than 30 minutes, and voltage at end of discharge not less than 1.67 V, warranted life must be not fewer than 20 discharge cycles.
c. For discharge rate not faster than 15 minutes, discharge duration not longer than 1.5 minutes, and voltage at end of discharge not less than 1.67 V, warranted life must be not fewer than 750 discharge cycles.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. Manufactured Unit: Indoor and outdoor, metal-clad switchgear, designed for application in solidly grounded neutral.

B. Comply with IEEE ANSI C37.20.2.

C. The switchgear ratings must comply with IEEE ANSI C37.04 and must be the preferred ratings of IEEE ANSI C37.06.

D. Switchgear Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by a qualified electrical testing laboratory, and marked for intended location and application.

2.2 MANUFACTURERS

A. Square-D, or approved equal by:

1. Eaton
2. Siemens

2.3 SWITCHGEAR ENCLOSURE

A. Indoor Enclosure: Steel.

B. Outdoor Enclosure: Weatherproof, galvanized steel, designed for installation outdoors. With full-height doors, with provisions for padlocking. With an integral structural-steel base frame with factory-applied asphaltic undercoating. The enclosure must meet IEEE ANSI C37.20.2 Annex A, Category A enclosure requirements.

1. Each vertical section must have the following features:

   a. Structural design and anchorage adequate to resist loads imposed by 125 mph wind.
   b. Space heater operating at one-half or less of rated voltage, sized to prevent condensation, controlled by thermostats to maintain temperature of each section above expected dew point.
   c. Louvers equipped with insect and rodent screens and filters and arranged to permit air circulation while excluding rodents and exterior dust.
   d. Weatherproof ground-fault circuit interrupter duplex receptacles.
   e. Power for heaters and receptacles must be provided by integral control power transformer.
   f. Skid Mounted: Mount each shipping group on an integral base frame as a complete weatherproof unit.

C. Enclosure Finish:

1. Outdoor Finish: Factory-applied finish in manufacturer's standard color, including under surfaces treated with corrosion-resistant undercoating.
2. Indoor Finish: Factory-applied finish in manufacturer's standard gray over a rust-inhibiting primer on treated metal surface.

2.4 SWITCHGEAR CONSTRUCTION

A. Dead front, metal-clad, draw-out, switchgear assembly of vertical sections, with vacuum circuit breakers. Provide additional vertical sections to house accessories related to the switchgear functions.

1. Front and rear access switchgear.
2. Front and rear vertical section covers with full-length hinges. The front cover must be a flanged door with latching hardware. The rear cover may be bolted.
3. Switchgear must be arc resistant, complying with IEEE ANSI C37.20.7, Type 1A.

B. Bus: Tin-plated copper.

1. Ground Bus: Sized to carry the rated short-time withstand current, extended full length of the switchgear assembly, and connected to the metal enclosures of each vertical section.

C. Circuit Breaker Compartments: Include a racking mechanism, circuit breaker operated automatic shutters covering the high-voltage bus connections, safety interlocks, and an electrical racking motor and accessories for remote racking of the circuit breaker**.**

D. Auxiliary Vertical Sections and Compartments:

1. Utility metering compartment that complies with utility company requirements.
2. Owner's Metering: Hinged panel in switch or breaker section for isolated access to meters and associated terminal and fuse blocks for maintenance, calibration, or testing while the gear is energized.

E. Circuit Breakers: Horizontally mounted, draw-out, vacuum circuit breakers, operated by a motor-charged stored-energy mechanism, and having manual means of charging the mechanism.

1. Electrically Operated: 120 V(ac) close, ac capacitor trip. Powered from a fused control transformer integral to the switchgear.

F. Accessory Set: Tools and miscellaneous items required for interrupter switchgear test, inspection, maintenance, and operation.

1. One of each size handling device to remove the circuit breaker from metal-clad switchgear and to move the breaker about on the floor.
2. Test cabinet with accessories to connect to the secondary contacts on an electrically operated removable element, permitting operation and testing of the removable element when it is removed from the housing.

G. Capacities and Characteristics:

1. Comply with IEEE ANSI C37.06.
2. Switchgear Assembly:

a. Rated Maximum Design Voltage and BIL (Dielectric Test): 15 kV, 95 kV.
b. Rated Continuous Current: 200A.

c. Rated Short-Circuit Current and Short-Time Current: 40 kA RMS.

3. Circuit Breakers:

a. Same capacities and characteristics as the switchgear assembly, and as follows:

1) Rated Continuous Current and Load Switching Current: 200 A
2) Rated Closing and Latching Current: 104 kA, peak >.
3) Rated Interrupting Time: 83 ms.

2.5 SURGE ARRESTERS

A. Comply with IEEE ANSI C62.11, distribution class; metal-oxide-varistor type, connected in each phase of incoming circuit and ahead of disconnecting device.

2.6 INSTRUMENTS

A. Instrument Transformers: Comply with IEEE ANSI C57.13.

1. Potential Transformers: Secondary voltage rating of 120 V and NEMA C 12.11 accuracy class of 0.3 with burdens of W, X, and Y.
2. Current Transformers: Burden and accuracy class suitable for connected relays, meters, and instruments.

B. Metering: Install the following listed Owner's instruments

C. Multifunction Digital Meter and Monitor: Microprocessor-based unit suitable for three- or four-wire systems.

1. Inputs from sensors or 5 A current-transformer secondaries, and potential terminals rated to 600 V.
2. Switch-selectable digital display with the following features:

a. Phase Currents, Each Phase: Plus or minus 1 percent.
b. Phase-to-Phase Voltages, Three Phase: Plus or minus 1 percent.
c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 1 percent.
d. Three-Phase Real Power: Plus or minus 2 percent.
e. Three-Phase Reactive Power: Plus or minus 2 percent.
f. Power Factor: Plus or minus 2 percent.
g. Frequency: Plus or minus 0.5 percent.
h. Integrated Demand, with Demand Interval Selectable from 5 to 60 Minutes: Plus or minus 2 percent.
i. Accumulated energy, in megawatt-hours, plus or minus 2 percent; stored values unaffected by power outages for up to 72 hours.

3. Communications module suitable for remote monitoring of meter quantities and functions. Interface communication and metering requirements

4. Mounting: Display and control unit that is flush or semi-flush mounted in instrument compartment door.

D. Analog Instruments: Rectangular, 4-1/2 inch square, 1 percent accuracy, semi-flush mounting, with anti-parallax 250-degree scale and external zero adjustment.

1. Voltmeters: Cover an expanded scale range of normal voltage plus 10 percent.
2. Voltmeter Selector Switch: Rotary type with off position to provide readings of phase-to-phase and phase-to-neutral] voltages.
3. Ammeters: Cover an expanded scale range of bus rating plus 10 percent.
4. Ammeter Selector Switch: Permits current reading in each phase and keeps current-transformer secondary circuits closed in off position.
5. Locate meter and selector switch on circuit-breaker compartment door for indicated feeder circuits only.
6. Watt-Hour Meters: Flush- or semi-flush-mounting type, 5 A, 120 V, three phase, three wire; with three elements, 15-minute indicating demand register, and provision for testing and adding pulse initiation.
7. Recording Demand Meter: Usable as totalizing relay or indicating and recording maximum demand meter with 15-minute interval.

   a. Operation: Counts and records a succession of pulses entering two channels.
   b. Housing: Drawout, back-connected case arranged for semiflush mounting.

2.7 PROTECTIVE RELAYS

A. Multifunctional, solid-state microprocessor-based relay systems, complying with IEEE ANSI C37.90.

B. Relay Mounting:

1. Each relay must be mounted in a drawout case with a two-stage quick-release operation.
2. Removal of the relay from the case must disconnect the trip circuits and short the current-transformer secondaries before the unit control power is disconnected.
3. When the relay is inserted into the case, control power connections must be made before the trip circuits are activated.
4. Include a self-shorting contact on the case terminal block for alarm indication and tripping of circuit breaker upon removal of the relay from the case.

C. Equip each relay system with a communications module to transmit the following data.

1. Relay's metered and target data, such as currents, set points, cause of trip, magnitude of trip current, and open-close trip status.
2. Ability to close and open the associated breaker with proper access code from remote location over the communication network when the relay is configured in remote open-close mode.

D. Overcurrent and Ground-Fault Protective Relays:

1. IEEE ANSI C37.2 device functions 51/50 and 51/50N.

2. Field-Selectable Relay Settings: Required by the overcurrent protective device coordination study and arc-flash study.
3. Primary Current-Transformer Ratings: Programmable from 5 to 5000 A.
4. Phase and Ground Protection: Field-selectable curves from IEEE moderately inverse, very inverse, or extremely inverse.
5. Phase Instantaneous Overcurrent Trip Pickup Point: Field selectable as "none" or from 1.0 to 25 times current-transformer primary rating. Include discriminator circuit with "on" and "off" switch so that when phase instantaneous overcurrent has been programmed to "none," the discriminator circuit protects against currents exceeding 11 times current-transformer primary rating when the breaker is being closed and must be deactivated after approximately eight cycles.
6. Contacts:
   a. Two Form-A contacts.
   b. Field selectable into contact pairs as follows and as required by the overcurrent protective device coordination study and arc-flash study:
      1) One contact assigned function 51 phase and function 51 ground, and the other contact assigned function 50 phase and function 50 ground.
      2) One contact assigned function 51/50 phase, and the other contact assigned function 51/50 ground.
7. Alphanumeric display to show the following parameters with metering accuracy not to exceed 2 percent of full scale:
   a. Individual phase currents.
   b. Ground current.
   c. Cause of trip.
   d. Magnitude and phase of current-causing trip.
   e. Phase or ground indication.
   f. Peak current demand for each phase and ground since last reset.
   g. Current-transformer primary rating.
   h. Programmed phase and ground set points.
8. Relay alarm and trip contacts must not change state if power is lost or an undervoltage occurs. These contacts must only cause a trip on detection of an overcurrent or fault condition based on programmed settings. A "protection off" alarm must be normally energized when the relay is powered and the self-diagnostics indicates the unit is functional. On loss of power or relay failure, this alarm relay must be de-energized, providing a fail-safe protection off alarm.

2.8 AC CONTROL POWER SUPPLY

A. Description: Control power transformer must supply 120 V(ac) control circuits through secondary disconnect and overcurrent protective devices.

1. Dry-type transformer, in separate compartment, with primary and secondary fuses to provide current-limiting and overload protection.

2.9 WARNING LABELS AND SIGNS

A. Install appropriate precautionary labels to warn about potential hazards that are inherent to the equipment. Comply with requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."

1. Warning signs must be baked enamel signs.
2. Equipment Identification Labels: Laminated acrylic or melamine plastic signs.

2.10 SOURCE QUALITY CONTROL

A. Perform production tests on each circuit breaker housing for this Project, complying with IEEE ANSI C37.09.

1. Perform mechanical operation tests to ensure proper functioning of shutters, operating mechanism, mechanical interlocks, and interchangeability of removable elements that are designed to be interchangeable.
2. Conduct an alignment test with master circuit breaker to verify interfaces.
3. Verify that control wiring is correct by verifying continuity. Perform electrical operation of relays and devices to ensure they function properly and in the intended sequence.
4. Perform the control wiring dielectric test at 1500 V for one minute.
5. Perform the dielectric test on primary and secondary circuits.

B. Perform production tests, on each circuit breaker supplied for this Project, complying with IEEE ANSI C37.09.

1. Perform mechanical operation tests to ensure proper functioning of the switch.
2. Conduct an alignment test with master cell to verify interfaces and interchangeability.
3. Verify the contact gap. Perform terminal-to-terminal resistance test.
4. Verify that control wiring is correct by verifying continuity. Perform electrical operation of relays and devices to ensure they function properly and in the intended sequence. Operate the circuit breakers over the range of minimum to maximum of the control voltage.
5. Perform the control wiring dielectric test at 1500 V for one minute.
6. Set the contact gap.

PART 3 - EXECUTION

3.1 SWITCHGEAR INSTALLATION

A. Equipment Mounting:

1. Install switchgear on cast-in-place concrete equipment base(s) in accordance with Section 260529 "Hangers and Supports for Electrical Systems."
2. Comply with requirements for vibration isolation and seismic control devices specified in Section 260548.16 "Seismic Controls for Electrical Systems."
3. Comply with requirements for vibration isolation devices specified in Section 260529 "Hangers and Supports for Electrical Systems."

B. Switchgear must be installed level and plumb. Switchgear must tilt less than 1.5 degrees while energized.

C. Maintain minimum clearances and workspace at equipment in accordance with manufacturer's instructions and NFPA 70.

D. Comply with NECA 430.

E. Set and adjust settings in accordance with Section 260572 "Overcurrent Protective Device Short-Circuit Study" and Section 260573.16 "Coordination Studies.

3.2 CONNECTIONS

A. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

B. Grounding Connections at Interior Locations:

1. Install bare copper cable not smaller than No. 4/0 AWG for grounding electrodes.
2. Bond surge arrester and neutrals directly to the switchgear enclosure and then to the grounding electrode system with bare copper conductors.
3. Keep leads as short as practicable with no kinks or sharp bends.
4. Make joints in grounding conductors and loops by exothermic weld or compression connector.

C. Grounding at Exterior Locations:

1. Install tinned bare copper cable not smaller than No. 4/0 AWG, for counterpoise buried not less than 30-inches below grade interconnecting the grounding electrodes.
2. Bond surge arrester and neutrals directly to the switchgear enclosure and then to the grounding electrode system with bare copper conductors, sized as shown.
3. Keep lead lengths as short as practicable with no kinks or sharp bends.
4. Fence and equipment connections must not be smaller than No. 4 AWG.
5. Ground fence at each gate post and corner post and at intervals not exceeding 10 ft.
6. Bond each gate section to the fence post using 1/8 by 1-inch tinned flexible braided copper strap and clamps.
7. Make joints in grounding conductors and loops by exothermic weld or compression connector.

D. Terminate grounding and bonding conductors on a common equipment grounding terminal on the switchgear enclosure. Install supplemental terminal bars, lugs, and bonding jumpers as required to accommodate the number of conductors for termination.

E. Complete switchgear grounding and lightning arrester connections prior to making other electrical connections.

F. Terminate medium-voltage cables in accordance with Section 260513 "Medium-Voltage Cables."

3.3 SIGNS AND LABELS

A. Comply with the installation requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."

B. Install warning signs as required to comply with 29 CFR 1910.269.

3.4 FIELD QUALITY CONTROL

A. Field tests and inspections must be witnessed by authorities having jurisdiction and Campus Representative.

B. General Field-Testing Requirements:

1. Comply with the provisions of NFPA 70B, "Testing and Test Methods."
2. After installing switchgear and after electrical circuitry has been energized, test for compliance with requirements.
3. Perform each visual and mechanical inspection and electrical test. Certify compliance with test parameters.

C. Medium-Voltage Switchgear Assembly Field Tests:

1. Visual and Mechanical Inspection:

a. Verify that fuse and circuit breaker sizes and types correspond to Drawings and coordination study, as well as to the circuit breakers address in the control network.
b. Verify that current and voltage transformer ratios correspond to Drawings.
c. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
d. Confirm correct operation and sequencing of electrical and mechanical interlock systems.

1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
2) Make key exchange with devices operated in off-normal positions.

e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
f. Inspect insulators for evidence of physical damage or contaminated surfaces.
g. Verify correct barrier and shutter installation and operation.
h. Exercise active components.
i. Inspect mechanical indicating devices for correct operation.
j. Verify that filters are in place and vents are clear.
k. Perform visual and mechanical inspection of instrument transformers in accordance with "Instrument Transformer Field Tests" Paragraph.
l. Inspect control power transformers.

1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
2) Verify that primary and secondary fuse or circuit breaker ratings match drawings.
3) Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.

2. Electrical Tests:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
b. Perform dc voltage insulation-resistance tests on each bus section, phase to phase and phase to ground, for one minute. If the temperature of the bus is other than plus or minus 20 deg. C, adjust the resulting resistance as provided in NETA ATS, Table 100.11.

1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.
2) Do not proceed to the dielectric withstand voltage tests until insulation-resistance levels are raised above minimum values.

c. Perform a dielectric withstand voltage test on each bus section, each phase to ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply the test voltage for one minute.

1) If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the test specimen is considered to have passed the test.

d. Perform insulation-resistance tests on control wiring with respect to ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate the applied voltage, follow the manufacturer's recommendation.

   1) Minimum insulation-resistance values of control wiring must not be less than 2 megohms.

e. Control Power Transformers:

   1) Perform insulation-resistance tests. Perform measurements from winding to winding and each winding to ground. Insulation-resistance values of winding insulation must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.1.
   2) Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to a rated secondary voltage source. Verify correct potential at all devices.
   3) Verify correct secondary voltage by energizing the primary winding with system voltage. Measure secondary voltage with the secondary wiring disconnected.
   4) Verify correct function of control transfer relays located in the switchgear with multiple control power sources.

f. Voltage Transformers:

   1) Perform secondary wiring integrity test. Verify correct potential at devices.
   2) Verify secondary voltages by energizing the primary winding with system voltage.

g. Perform current-injection tests on the entire current circuit in each section of switchgear.

   1) Perform current tests by secondary injection with magnitudes such that a minimum current of 1.0 A flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.
   2) Perform current tests by primary injection with magnitudes such that a minimum of 1.0 A flows in the secondary circuit. Verify correct magnitude of current at each device in the circuit.

h. Perform system function tests in accordance with "System Function Tests" Article.
i. Verify operation of space heaters.
j. Perform phasing checks on double-ended or dual-source switchgear to ensure correct bus phasing from each source.

D. Medium-Voltage Vacuum Circuit Breaker Field Tests:

1. Visual and Mechanical Inspection:
   a. Inspect physical and mechanical condition.
   b. Inspect anchorage, alignment, grounding, and required clearances.
   c. Verify that maintenance devices such as special tools and gages specified by the manufacturer are available for servicing and operating the breaker.
   d. Verify the unit is clean.
   e. Perform mechanical operation tests on operating mechanism in accordance with manufacturer's published data.
   f. Measure critical distances on operating mechanism as recommended by the manufacturer. Critical distances of the operating mechanism must be in accordance with manufacturer's published data.
   g. Verify cell fit and element alignment.
   h. Verify racking mechanism operation.
   i. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
   j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
   k. Perform time-travel analysis. Travel and velocity values must be in accordance with manufacturer's published data.
   l. Record as-found and as-left operation counter reading. Operation counter must advance one digit per close-open cycle.

2. Electrical Tests:
   a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than this table or manufacturer's recommendations. Dielectric-withstand-voltage tests must not proceed until insulation-resistance levels are raised above minimum values.
   b. Perform a contact/pole-resistance test. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value. Micro-ohm or dc millivolt drop values must not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's published data is not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
   c. Perform minimum pickup voltage tests on trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of the trip and close coils must comply with manufacturer's published data. In the absence of the manufacturer's published data, comply with NETA ATS, Table 100.20.
   d. Verify correct operation of auxiliary features, such as electrical close and trip operation, trip-free operation, and anti-pump function. Auxiliary features must operate in accordance with manufacturer's published data.

e. Trip circuit breaker by operation of each protective device. Reset trip logs and indicators.
f. Perform power-factor or dissipation-factor tests on each pole with the breaker open and each phase with the breaker closed. Power-factor or dissipation-factor values must comply with manufacturer's published data.
g. Perform vacuum bottle integrity (dielectric-withstand-voltage) test across each vacuum bottle, with the contacts in the "open" position in accordance with manufacturer's published data. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the vacuum bottle integrity test, the test specimen is considered to have passed the test.
h. Perform a dielectric-withstand-voltage test in accordance with manufacturer's published data. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric-withstand-voltage test, the test specimen is considered to have passed the test.
i. Verify operation of heaters.

E. Instrument Transformer Field Tests:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data complies with Contract Documents.
b. Inspect physical and mechanical condition.
c. Verify correct connection of transformers with system requirements.
d. Verify that adequate clearances exist between primary and secondary circuit wiring.
e. Verify the unit is clean.
f. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.
g. Verify that required grounding and shorting connections provide contact.
h. Verify correct operation of transformer withdrawal mechanism and grounding operation.
i. Verify correct primary and secondary fuse sizes for voltage transformers.
j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

2. Electrical Tests of Current Transformers:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
b. Perform insulation-resistance test of each current transformer and its secondary wiring with respect to ground at 1000 V(dc) for one minute. For units with solid-state components that cannot tolerate the applied voltage, follow manufacturer's recommendations. Investigate and correct values of insulation resistance less than manufacturer's written recommendations or NETA ATS, Table 100.5.

c. Perform a polarity test of each current transformer in accordance with IEEE ANSI C57.13.1. Polarity results must agree with transformer markings.
d. Perform a ratio-verification test using the voltage or current method in accordance with IEEE ANSI C57.13.1. Ratio errors must be in accordance with IEEE ANSI C57.13.
e. Perform an excitation test on transformers used for relaying applications in accordance with IEEE ANSI C57.13.1. Excitation results must match the curve supplied by the manufacturer or be in accordance with IEEE ANSI C57.13.1.
f. Measure current circuit burdens at transformer terminals in accordance with IEEE ANSI C57.13.1. Measured burdens must be compared with and must match instrument transformer ratings.
g. Perform insulation-resistance tests on the primary winding with the secondary grounded. Test voltages must be in accordance with Table 100.5.
h. Perform dielectric withstand tests on the primary winding with the secondary grounded. Test voltages must be in accordance with Table 100.9.
i. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data.
j. Verify that current transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE ANSI C57.13.3. That grounding point should be located as specified by the engineer in the project drawings.

3. Electrical Tests of Voltage Transformers.

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
b. Perform insulation-resistance tests winding-to-winding and each winding to ground. Test voltages must be applied for one minute in accordance with Table 100.5. For units with solid-state components that cannot tolerate the applied voltage, follow manufacturer's recommendations. Investigate and correct values of insulation resistance less than manufacturer's recommendations or NETA ATS, Table 100.5.
c. Perform a polarity test on each transformer to verify the polarity marks or H1-X1 relationship as applicable. Polarity results must agree with transformer markings.
d. Perform a turns-ratio test on tap positions. Ratio errors must be in accordance with IEEE ANSI C57.13.
e. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared with and must match instrument transformer ratings.
f. Perform a dielectric withstand test on the primary windings with the secondary windings connected to ground. The dielectric voltage must be in accordance with Table 100.9. The test voltage must be applied for one minute. If no evidence of distress or insulation failure is observed by the end of the total time of voltage application during the dielectric withstand test, the primary windings are considered to have passed the test.
g. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use test equipment manufacturer's published data.

h. Verify that voltage transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE ANSI C57.13.3. Test results must indicate that the circuits are grounded at only one point.

F. Ground Resistance Test

1. Visual and Mechanical Inspection:

a. Verify ground system complies with Contract Documents and NFPA 70 Article 250, "Grounding and Bonding."
b. Inspect physical and mechanical condition. Grounding system electrical and mechanical connections must be free of corrosion.
c. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.
d. Inspect anchorage.

2. Electrical Tests.

a. Perform fall-of-potential or alternative test in accordance with IEEE Std 81 on the main grounding electrode or system. The resistance between the main grounding electrode and ground must be no more than 5 ohms
b. Perform point-to-point tests to determine the resistance between the main grounding system and major electrical equipment frames, system neutral, and derived neutral points. Investigate point-to-point resistance values that exceed 0.5 ohm. Compare equipment nameplate data with Contract Documents.
c. Inspect physical and mechanical condition.
d. Inspect bolted electrical connections for high resistance using a low-resistance ohmmeter to compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.

G. Metering Devices Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect bolted electrical connections using calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use NETA ATS, Table 100.12.
c. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.
d. Verify the unit is clean.
e. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

a. Inspect bolted electrical connections using a low resistance ohmmeter to compare bolted resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of the lowest value.
b. Verify accuracy of meters at cardinal points. Meter accuracy must be in accordance with manufacturer's published data.
c. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.
d. Verify instrument multipliers. Instrument multipliers must be in accordance with system design specifications.
e. Verify that current transformer and voltage transformer secondary circuits are intact. Test results must confirm the integrity of the secondary circuits of current and voltage transformers.

H. Medium-Voltage Surge Arrester Field Tests:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data complies with Contract Documents.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify the arresters are clean.
e. Verify that the ground lead on each device is individually attached to a ground bus or ground electrode.
f. Verify that the stroke counter is correctly mounted and electrically connected if applicable. Record the stroke counter reading.

2. Electrical Test:

a. Perform an insulation-resistance test on each arrester, phase terminal-to-ground. Apply voltage in accordance with manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Replace units that fail to meet recommended minimum insulation resistance listed in the table.
b. Perform a watts-loss test. Evaluate watts-loss values by comparison with similar units and test equipment manufacturer's published data.
c. Test grounding connections. Resistance between the arrester ground terminal and the ground system must be less than 0.5 ohm.

I. Microprocessor-Based Protective Relay Field Tests:

1. Visual and Mechanical Inspection:

a. Record model number, style number, serial number, firmware revision, software revision, and rated control voltage.
b. Verify operation of light-emitting diodes, display, and targets.
c. Record passwords for each access level.
d. Clean the front panel and remove foreign material from the case.
e. Check tightness of connections.

f. Verify that the frame is grounded in accordance with manufacturer's instructions.
g. Set the relay in accordance with results in Section 260573.16 "Coordination Studies" and in Section 260573.19 "Arc-Flash Hazard Analysis."
h. Download settings from the relay. Print a copy of the settings for the report and compare the settings to those specified in the coordination study.

2. Electrical Tests:

a. Perform insulation-resistance tests from each circuit to the grounded frame in accordance with manufacturer's published data.
b. Apply voltage or current to analog inputs and verify correct registration of the relay meter functions.
c. Functional Operation: Check functional operation of each element used in the protection scheme as follows:

1) Timing Relay:

a) Determine time delay.
b) Verify operation of instantaneous contacts.

2) Volts/Hertz Relay:

a) Determine pickup frequency at rated voltage.
b) Determine pickup frequency at a second voltage level.
c) Determine time delay.

3) Sync Check Relay:

a) Determine closing zone at rated voltage.
b) Determine maximum voltage differential that permits closing at zero degrees.
c) Determine live line, live bus, dead line, and dead bus set points.
d) Determine time delay.
e) Verify dead bus/live line, dead line/live bus, and dead bus/dead line control functions.

4) Undervoltage Relay:

a) Determine dropout voltage.
b) Determine time delay.
c) Determine time delay at a second point on the timing curve for inverse time relays.

5) Directional Power Relay:

a) Determine minimum pickup at maximum torque angle.
b) Determine closing zone.
c) Determine maximum torque angle.
d) Determine time delay.
e) Verify time delay at a second point on the timing curve for inverse time relays.

6) Current Balance Relay:

a) Determine pickup of each unit.
b) Determine percent slope.
c) Determine time delay.

7) Negative Sequence Current Relay:

a) Determine negative sequence alarm level.
b) Determine negative sequence minimum trip level.
c) Determine maximum time delay.
d) Verify two points on the I-two-squared-t curve.

8) Phase Sequence or Phase Balance Voltage Relay:

a) Determine positive sequence voltage to close the NO contact.
b) Determine positive sequence voltage to open the NC contact (undervoltage trip).
c) Verify negative sequence trip.
d) Determine time delay to close the NO contact with sudden application of 120 percent of pickup.
e) Determine time delay to close the NC contact upon removal of voltage when previously set to rated system voltage.

9) Instantaneous Overcurrent Relay:

a) Determine pickup.
b) Determine dropout.
c) Determine time delay.

10) Time Overcurrent:

a) Determine minimum pickup.
b) Determine time delay at two points on the time current curve.

11) Ground Detector Relay:

a) Determine maximum impedance to ground causing relay pickup.

12) Directional Overcurrent Relay:

a) Determine directional unit minimum pickup at maximum torque angle.
b) Determine closing zone.
c) Determine overcurrent unit pickup.
d) Determine overcurrent unit time delay at two points on the time current curve.

d. Control Verification:

1) Functional Tests:

a) Check operation of active digital inputs.

b) Check output contacts or silicone-controlled rectifiers (SCRs), preferably by operating the controlled device, such as circuit breaker, auxiliary relay, or alarm.
c) Check internal logic functions used in protection scheme.
d) Upon completion of testing, reset min/max recorders, communications statistics, fault counters, sequence-of-events recorder, and event records.

2) In-Service Monitoring: After the equipment is initially energized, measure magnitude and phase angle of inputs and verify expected values.

J. DC System VRLA Batteries Field Test:

1. Visual and Mechanical Inspection:

a. Verify that batteries are adequately located.
b. Verify that battery area ventilation system is operable.
c. Verify existence of suitable eyewash equipment.
d. Verify equipment nameplate data complies with Contract Documents.
e. Inspect physical and mechanical condition.
f. Verify adequacy of battery support racks, mounting, anchorage, alignment, grounding, and clearances.
g. Verify the units are clean.
h. Inspect spill containment installation.
i. Verify application of an oxide inhibitor on battery terminal connections.

2. Electrical Tests:

a. Measure charger float and equalizing voltage levels. Adjust to battery manufacturer's recommended levels.
b. Verify charger functions and that alarms comply with system manufacturer's recommendations.
c. Measure negative post temperature. Negative post temperature must comply with manufacturer's published data or IEEE Std 1188.
d. Measure charger float and equalizing voltage levels. Charger float and equalizing voltage levels must be in accordance with the battery manufacturer's published data.
e. Measure each mono-block/cell voltage and total battery voltage with charger energized and in float mode of operation. Monoblock/cell voltages must be in accordance with manufacturer's published data.
f. Measure intercell connection resistances.
g. Perform internal ohmic measurement tests. Cell internal ohmic values (resistance, impedance, or conductance) must not vary by more than 25 percent between identical cells that are in a fully charged state. Monoblock/cell internal ohmic values (resistance, impedance, or conductance) must not vary by more than 25 percent between identical mono-blocks/cells in a fully charged state.
h. Perform a load test in accordance with manufacturer's published data or IEEE Std 1188. Replace units that fail to pass the test.

i. Measure the battery system voltage from positive to ground and negative to ground. Voltage measured from positive to ground must be equal in magnitude to the voltage measured from negative to ground.

K. DC System Vented NiCd Batteries Field Test:

1. Visual and Mechanical Inspection:

a. Verify that batteries are adequately located.
b. Verify that battery area ventilation system is operable.
c. Verify existence of suitable eyewash equipment.
d. Verify equipment nameplate data complies with Contract Documents.
e. Inspect physical and mechanical condition.
f. Verify adequacy of battery support racks, mounting, anchorage, alignment, grounding, and clearances.
g. Verify electrolyte level. Measure pilot-cell electrolyte temperature, and correct as recommended by manufacturer's maintenance procedures to bring the temperature and electrolyte level to within normal limits.
h. Verify the units are clean.
i. Inspect spill containment installation.
j. Verify application of an oxide inhibitor on battery terminal connections.

2. Electrical Tests:

a. Measure charger float and equalizing voltage levels. Adjust to battery manufacturer's recommended levels.
b. Verify charger functions and that alarms comply with system manufacturer's recommendations.
c. Measure each cell voltage and total battery voltage with charger energized and in float mode of operation. Cell voltages must be within 0.05 volt of each other or in accordance with manufacturer's published data.
d. Measure intercell connection resistances.
e. Perform internal ohmic measurement tests. Cell internal ohmic values (resistance, impedance, or conductance) must not vary by more than 25 percent between identical cells that are in a fully charged state.
f. Perform a load test in accordance with manufacturer's published data or IEEE Std 1106. Replace units that fail to pass the test.
g. Measure the battery system voltage from positive to ground and negative to ground. Voltage measured from positive-to-ground must be equal in magnitude to the voltage measured from negative to ground.

L. Switchgear will be considered defective if it does not pass tests and inspections.

M. Nonconforming Work:

1. Remove and replace defective units and retest.

N. Prepare test and inspection reports. Record as-left set points of adjustable devices.

3.5 SYSTEM FUNCTION TESTS

A. System function tests must prove the correct interaction of sensing, processing, and action devices. Perform system function tests after field quality control tests have been completed and components have passed specified tests.

1. Develop test parameters and perform tests for the purpose of evaluating performance of integral components and their functioning as a complete unit within design requirements and manufacturer's published data.
2. Verify the correct operation of interlock safety devices for fail-safe functions in addition to design function.
3. Verify the correct operation of sensing devices, alarms, and indicating devices.

END OF SECTION 261326

SECTION 262200 - LOW-VOLTAGE TRANSFORMERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:

1. Distribution transformers.

1.3 ACTION SUBMITTALS

A. Product Data: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer indicated.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring.
2. Mounting: Custom structural steel racks, concrete pads, and associated hardware.

1.4 INFORMATIONAL SUBMITTALS

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain each transformer type through one source from a single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."

1.7 DELIVERY, STORAGE, AND HANDLING

A. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.8 COORDINATION

A. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

B. Coordinate installation of structural steel rack or wall-mounting and structure-hanging supports with actual transformer provided.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Acme Electric Corporation.
2. Challenger Electrical Equipment Corp.
3. Controlled Power Company.
4. Eaton Electrical Sector; Eaton Corporation; Cutler-Hammer Products.
5. Federal Pacific Transformer Company.
6. General Electric Company.
7. Hammond Co.
8. Magnetek Power Electronics Group.
9. Micron Industries Corp.
10. Myers Power Products, Inc.
11. Siemens Energy & Automation, Inc.
12. Sola/Hevi-Duty.
13. Square D Co./Groupe Schneider NA; Schneider Electric.

2.2 GENERAL TRANSFORMER REQUIREMENTS

A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

B. Cores: Grain-oriented, non-aging silicon steel.

C. Coils: Continuous windings without splices except for taps.

1. Internal Coil Connections: Brazed or pressure type.
2. Coil Material: Aluminum.

2.3 DISTRIBUTION TRANSFORMERS

A. Comply with NEMA ST 20, and list and label as complying with UL 1561.

B. Provide transformers that are constructed to withstand seismic forces specified in Section 260548.16 "Seismic Controls for Electrical Systems."

C. Cores: One leg per phase.

D. Enclosure: Ventilated, NEMA 250, Type 2.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

E. Enclosure: Ventilated, NEMA 250, Type 3R.

1. Core and coil shall be encapsulated within resin compound, sealing out moisture and air.

F. Transformer Enclosure Finish: Comply with NEMA 250.

1. Finish Color: Gray.

G. Taps for Transformers Smaller Than 3 kVA: None.

H. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

I. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

J. Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.

K. Energy Efficiency for Transformers Rated 15 kVA and Larger:

1. Complying with NEMA TP 1, Class 1 efficiency levels.
2. Tested according to NEMA TP 2.

L. K-Factor Rating: Transformers indicated to be K-factor rated shall comply with UL 1561 requirements for non-sinusoidal load current-handling capability to the degree defined by designated K-factor.

1. Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
2. Indicate value of K-factor on transformer nameplate.

M. Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize interwinding capacitance.

1. Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
2. Include special terminal for grounding the shield.
3. Shield Effectiveness:

    a. Capacitance between Primary and Secondary Windings: Not to exceed 33 picofarads over a frequency range of 20 Hz to 1 MHz.
    b. Common-Mode Noise Attenuation: Minimum of minus 120 dBA at 0.5 to 1.5 kHz; minimum of minus 65 dBA at 1.5 to 100 kHz.
    c. Normal-Mode Noise Attenuation: Minimum of minus 52 dBA at 1.5 to 10 kHz.

N. Wall Brackets: Manufacturer's standard brackets.

2.4 IDENTIFICATION DEVICES

A. Nameplates: Engraved, laminated-plastic or metal nameplate for each transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

2.5 SOURCE QUALITY CONTROL

A. Test and inspect transformers according to IEEE C57.12.91.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.

B. Provide custom fabricated structural steel transformer mounting racks as directed by Campus Representative.

C. Construct concrete bases and anchor floor-mounting transformers according to manufacturer's written instructions, seismic codes applicable to Project, and requirements in Section 260529 "Hangers and Supports for Electrical Systems."

3.3 CONNECTIONS

A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.

B. Perform tests and inspections and prepare test reports.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.

D. Remove and replace units that do not pass tests or inspections and retest as specified above.

E. Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of transformer connections.

1. Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.
2. Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.

F. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.5 ADJUSTING

A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 10 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.6 CLEANING

A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

END OF SECTION 26 22 00

SECTION 262300 - LOW-VOLTAGE SWITCHGEAR

PART 1 - GENERAL

1.1 SUMMARY

A. The Work of This Section Includes:

1. Metal-enclosed, low-voltage switchgear, with draw-out power circuit breakers and metering and control accessories.

   a. Switchgear structure.
   b. Additional requirements for indoor switchgear.
   c. Additional requirements for outdoor switchgear.
   d. Circuit breakers.
   e. Surge suppression.
   f. Control power supply, 120 V(ac).
   g. Control power supply, 24 V(dc).
   h. Instrumentation and control.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Coordination Meeting(s): For switchgear. Conduct meeting(s) at Project site, Construction Manager's trailer.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of product.

   a. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for switchgear.
   b. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings:

1. For low-voltage switchgear.

   a. System Power One-Line Diagrams: Depict power sources, feeders, distribution components, and major loads. Include as-built data for low-voltage power switchgear and connections as follows:

      1) Frame size of circuit breakers.

2) Trip rating for circuit breakers.
3) Conduit and wire size for feeders.

b. Include plans, elevations, sections, shipping splits, and mounting details.
c. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of field connections.
d. Wire Termination Diagrams and Schedules: Include diagrams for power, signal, and control wiring. Identify terminals and wiring designations and color-codes to facilitate installation, operation, and maintenance. Indicate recommended types, wire sizes, and circuiting arrangements for field-installed wiring, and show circuit protection features. Differentiate between manufacturer-installed and field-installed wiring.
e. Indicate short-time and short-circuit current rating of switchgear assembly.
f. Include features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
g. Include mimic-bus diagram.

C. Delegated Design Submittals: For low-voltage switchgear.

1. Comply with Section 260572 "Overcurrent Protective Device Short-Circuit Study" and Section 260573.16 "Coordination Studies."
2. For differential ground-fault protection scheme. Include wiring diagram of differential system along with test procedure recommended by UL 1558, using high-current injection equipment.

D. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Submit evidence that switchgear is compatible with connected monitoring and control devices and systems specified.

1. Show interconnecting signal and control wiring, and interface devices to show compatibility of meters.
2. For reporting and billing interfaces and adapters, list network protocols and provide statements from manufacturers that input and output devices comply with interoperability requirements of protocol.

B. Manufacturers' Published Instructions: Record copy of official installation and testing instructions issued to Installer by manufacturer for the following:

1. For unloading and inspection, clearances, torque values, insulation-resistance testing, dielectric withstand-voltage testing, breaker testing, power factor testing, grounding, ground-fault protection testing, batteries and chargers testing, and system functional testing.

C. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. System Power Riser Diagram: For switchgear, using non-fugitive ink on high-quality paper. Post on wall at switchgear location.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Spare Parts: Furnish to Owner the following spare parts for repairing switchgear that are packaged with protective covering for storage on-site and identified with labels describing contents:

1. Draw-out Circuit Breakers: One of each type and rating used for circuit breaker in switchgear.
2. Fuses: One for every three < > of each type and rating, but no fewer than three of each for the following:

    a. Potential transformers.
    b. Control power circuits.

B. Special Tools: Furnish to Owner proprietary equipment, keys, and software required to operate, maintain, repair, adjust, or implement future changes to switchgear, packaged with protective covering for storage on-site and identified with labels describing contents. Include the following:

1. Portable test set for testing functions of circuit-breaker, solid-state trip devices without removal from switchgear.
2. Relay and meter test plugs suitable for testing switchgear meters and switchgear class relays.
3. Racking handle to move circuit breaker manually between connected and disconnected positions.
4. Circuit-Breaker Removal Apparatus:

    a. Floor Type: Portable, floor-supported, roller-base, elevating carriage arranged for moving circuit breakers in and out of compartments.

5. Spare-Fuse Cabinet: Identified and compartmented steel box or cabinet with lockable door.
6. Storage for Manual: Include rack or holder, near operating instructions, for copy of maintenance manual.

C. Consumable Items:

1. After completion of field quality control, startup, commissioning, adjusting, and closeout activities, replace air filters and refill fluid reservoirs.

PART 2 - PRODUCTS

2.1 LOW-VOLTAGE SWITCHGEAR

A. As Manufactured by Square – D, or approved equal by:

1. Eaton
2. Siemens

2.2 SYSTEM DESCRIPTION

A. Description: Metal-enclosed, low-voltage switchgear with draw-out power circuit breakers, with accessories and metering components.

1. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.
2. Comply with IEEE C37.20.1.
3. Listed and labeled as complying with UL 1558.
4. Listed and labeled for use as service entrance equipment.

2.3 PERFORMANCE REQUIREMENTS

A. Capacities and Characteristics:

1. Nominal System Voltage: 480/277 V, four wire, 60 Hz.
2. Rated Insulation Level: Power frequency withstand must be not less than 2.2 kV(rms).
3. Rated Continuous Current:

   a. Main-Bus Continuous: 4000 A.

4. Rated Short-Circuit Withstand Current: 65 000A (sym).
5. Short-Time and Short-Circuit Current: Match rating of integrated short-circuit current rating.

2.4 SWITCHGEAR STRUCTURE

A. Allow circuit-breaker functions to be performed when compartment door is closed:

B. Install instrument compartments when additional space is required for metering and instrumentation. Allow for routing of instrumentation, control and communications wires, and cables.

C. Switchgear Bus:

1. Use bus bars to connect compartments and vertical sections. Cable connections are not permitted.
2. Main Phase Bus: Uniform capacity entire length of assembly.
3. Neutral Bus: 100 percent of phase-bus ampacity unless otherwise indicated. Equip bus with pressure-connector terminations for outgoing circuit neutral conductors.
4. Ground Bus: Uniform capacity entire length of assembly, with pressure connector terminations for feeder and branch-circuit ground conductors, minimum size 1/4 by 2 inch.
5. Bus Material and Connections:
    a. Phase- and Neutral-Bus Material: Hard-drawn copper of 98 percent minimum conductivity, with copper feeder circuit-breaker line connections.
    b. Use copper for connecting circuit-breaker line to copper bus.
    c. Contact Surfaces of Buses: Silver plated.
    d. Feeder Circuit-Breaker Load Terminals: Silver-plated copper bus extensions equipped with pressure connectors for outgoing circuit conductors.
6. Neutral Disconnect Link: Bolted, uninsulated, bus, arranged to connect neutral bus to ground bus.

D. Circuit-Breaker Compartment:

1. Drawout Features: Circuit-breaker mounting assembly equipped with racking mechanism to position circuit breaker and hold it rigidly in connected, test, disconnected, and withdrawn positions. Include the following features:
    a. Provide circuit-breaker racking system with positive stops at connected, test, disconnected, and withdrawn positions.
    b. Circuit-Breaker Positioning: Permit racking of open circuit breaker to or from connected, test, and disconnected positions only when compartment door is closed unless live parts are covered by full dead-front shield. Permit manual withdrawal of open circuit breaker to position for removal from structure.
    c. Primary Disconnect: Mount on stationary part of compartment. Disconnect must consist of set of contacts extending to rear through insulating support barrier, and of corresponding moving finger contacts on power circuit-breaker studs, which engage in only connected position. Assembly must provide multiple silver-to-silver full floating, spring-loaded, high-pressure-point contacts with uniform pressure on fingers. Load studs must connect to bus extensions that terminate in solderless terminals in rear cable compartment.
    d. Secondary Disconnect: Floating terminals mounted on stationary part of compartment that engage mating contacts at front of breaker.
    e. Provide verification of positive ground contact between circuit breaker and its compartment when accessory cover is removed while circuit breaker is in connected, test, disconnected, and withdrawn positions.

2.5 ADDITIONAL REQUIREMENTS FOR INDOOR SWITCHGEAR

A. Enclosure Rating: Indoor.

B. Enclosure Material: Steel.

C. Enclosure Finish: IEEE C37.20.1, manufacturer's standard gray finish over rust-inhibiting primer on phosphatizing-treated metal surfaces.

D. Enclosure Rear Panels: Removable and hinged, to allow access to rear interior of switchgear.

2.6 CIRCUIT BREAKERS

A. Drawout type, unfused, power operated, with electromechanical or electronic trip devices. Comply with IEEE C37.13, IEEE C37.13a, and UL 1066.

B. Ratings: For continuous, interrupting, and short-time current ratings for circuit breakers; voltage and frequency ratings same as switchgear. Comply with IEEE C37.16.

C. Operating Mechanism: Mechanically and electrically trip-free, stored-energy operating mechanism with the following features:

1. Normal Closing Speed: Independent of both control and operator.
2. Slow Closing Speed: Optional with operator for inspection and adjustment.
3. Stored-Energy Mechanism: Manually charged.
4. Operation counter.

D. Operator Display: Located on face of circuit breaker.

1. Electrical operation buttons to open and close circuit breaker. Provide clear lockable cover over buttons.
2. Indicating Lights: To indicate circuit breaker is open or closed. Energized or hot condition must be indicated by red light. De-energized, open, and safe condition must be indicated by green light.
3. Provide "Charged-not OK to close" indicator when closing springs are charged but circuit breaker is not ready to close.

E. Overcurrent Protective Tripping: Microprocessor-based, programmable, time-current shaping adjustments; complete with current transformers and sensors and the following features:

1. Programmable functions independent of each other in both action and adjustment.
   a. Long-time setting.
   b. Long-time-delay with selectable I^2T or I^4T curve shaping.
   c. Short-time setting.
   d. Short-time-delay with flat or selectable I^2T curve shaping.
   e. Instantaneous trip.
2. Field-adjustable, time-current characteristics.
3. Current Adjustability: Dial settings and rating plugs on trip units, or sensors on circuit breakers, or combination of these methods.
4. Three bands, minimum, for long-time- and short-time-delay functions; marked "minimum," "intermediate," and "maximum."
5. Pickup Points:

a. Five minimum, for long-time- and short-time-trip functions. Equip short-time-trip function for switchable I^2T operation.
b. Five minimum, for instantaneous-trip functions.

F. Ground-Fault Protection:

1. Ground-fault protection with at least three short-time-delay settings and three trip-time-delay bands; adjustable current pickup.
2. Trip Indication: Labeled, battery-powered lights or mechanical targets on trip device to indicate type of fault.

G. Undervoltage Trip Devices:

1. Instantaneous, with adjustable pickup voltage.
2. Adjustable time-delay and pickup voltage.

H. Metering:

1. Accuracy: 0.5 percent of reading, complying with ANSI C12.20.
2. Values must be RMS average over period of one second.

I. Auxiliary Contacts:

1. Contacts and switches required for normal circuit-breaker operation, sufficient for interlocking and remote indication of circuit-breaker position.
2. Spare auxiliary switches, at least two, unless otherwise indicated. Switches must consist of two Type A and two Type B contacts wired through secondary disconnect devices to terminal block in stationary circuit-breaker compartment.

J. Arc Chutes: Readily removable from associated circuit breaker when it is in disconnected position and arranged to permit inspection of contacts without removing circuit breaker from switchgear.

K. Padlocking Provisions: For installing at least three padlocks on circuit breakers to secure its enclosure and prevent movement of draw-out mechanism.

2.7 SURGE SUPPRESSION

A. Factory Installed: Integral part of low-voltage switchgear, complying with UL 1449 SPD, Type 1, with the following features and accessories:

1. Integral disconnect switch.
2. Internal thermal protection that disconnects SPD before damaging internal suppressor components.
3. Indicator light display for protection status.
4. Form-C contacts rated at 5 A 250 V(ac), one N.O. and one N.C., for remote monitoring of protection status. Contacts must reverse on failure of surge diversion module or on opening of current-limiting device.

5. Surge counter.

2.8 CONTROL POWER SUPPLY, 120 V(ac)

A. Control Power Transformer: Supply 120 V control circuits through dry-type control power transformers, include secondary disconnect devices.

1. Place transformers larger than 3 kVA in separate compartments at bottom of vertical section, including related primary and secondary fuses.

a. Secondary windings connected through relay(s) to control bus to affect automatic transfer scheme.

2. Control Power Fuses: Primary and secondary fuses provide current-limiting and overload protection.

2.9 CONTROL POWER SUPPLY, 24 V(dc)

A. System Requirements: Battery must have number of cells and ampere-hour capacity based on initial specific gravity of 1.210 at 25 deg C with electrolyte at normal level and minimum ambient temperature of 13 deg C. Cycle battery before shipment to guarantee rated capacity on installation. Arrange battery to operate ungrounded. Battery system capacity must be as recommended by switchgear manufacturer to operate circuit breakers for intended duty.

B. Battery: Vented NiCd, batteries, with battery disconnect and overcurrent protective device.

C. Rack: Two-step rack with electrical connections between battery cells and between rows of cells; include two flexible connectors with bolted-type terminals for output leads

D. Accessories:

1. Thermometers with specific-gravity correction scales.
2. Hydrometer syringes.
3. Set of cell numerals.

E. Charger: Static-type silicon rectifier equipped with automatic regulation and provision for manual and automatic adjustment of charging rate. Unit must automatically maintain output voltage within 0.5 percent from no load to rated charger output current, with AC input-voltage variation of plus or minus 10 percent and input-frequency variation of plus or minus 3 Hz.

1. DC ammeter.
2. DC Voltmeter: Maximum error of 5 percent at full-charge voltage, with toggle switch to select between battery and charger voltages.
3. Ground Indication: Two appropriately labeled lights to indicate circuit ground, connected in series between negative and positive terminals, with midpoint junction connected to ground by N.O. push-button contact.
4. Capacity: Sufficient to supply steady load, float-charge battery between 2.20 and 2.25 V per cell, and equalizing charge at 2.33 V per cell.

5. Charging-Rate Switch: Manually operated switch to transfer to higher charging rate. Charger operation must be automatic until manually reset.
6. AC Power Supply: 120 V, 60 Hz, subject to plus or minus 10 percent variation in voltage and plus or minus 3 Hz variation in frequency. Automatic charger operation must resume after loss of AC power supply for interval.
7. Charging Regulator: Protect charger from damage due to overload, including short circuit on output terminals. Device must regulate charging current but may not disconnect charger from either battery or AC supply.
8. Charger's Audible Noise: Less than 26 dB(A-weighted).

2.10 INSTRUMENTATION AND CONTROL

A. Power Distribution Equipment must be web enabled, direct connected to Local Area Network (LAN) or Intranet.

B. Ethernet Connectivity:

1. Install multipoint, TIA-485 MODBUS serial communications network within switchgear to interconnect breaker trip units, protective relays, drives, and metering devices equipped with communications.
2. Serial communications network must be wired to Ethernet gateway in switchgear. Gateway must be web enabled, with integral network port and embedded web server with factory-configured firmware and HTML-formatted web pages for viewing of power monitoring and equipment status information from switchgear devices equipped with digital communication ports.
3. LAN must consist of multipoint, TIA-485 MODBUS serial communication network to interconnect breaker trip units, protective relays, drives, and metering devices equipped with communications. Serial communication network must be connected to Ethernet server that functions as gateway and server, providing data access via 10 Base-TLAN.
4. Server Configuration:

    a. Initial network parameters set using standard web browser. Connect via local operator interface, or TIA-1096 Type 8P8C jack accessible from front of equipment.
    b. Network server must be factory programmed with embedded HTML-formatted web pages that are user configurable and that provide detailed communication diagnostic information for serial and Ethernet ports as status of TIA-485 network; with internal memory management information pages for viewing using standard web browser.
    c. Password-protected login, with password administration accessible from LAN using standard web browser.
    d. Operating Software: Suitable for local access; firewall protected.

5. All serial communications devices within equipment must be addressed at factory and tested.

C. Instrument Transformers: Comply with IEEE C57.13. Instrument transformers may not be used to power space conditioning equipment associated with outdoor switchgear, of for power to convenience receptacles and lighting.

1. Potential Transformers: Secondary voltage rating of 120 V and NEMA C12.11 Accuracy class of 0.3 with burdens of W, X, and Y.
2. Current Transformers: Burden and Accuracy class suitable for connected relays, meters, and instruments.

D. Power Monitoring: Separately mounted, modular, permanently installed, solid-state, digital I/O multifunction metering instrument for power and energy metering and monitoring, complying with UL 61010-1.

1. Capable of metering four-wire wye, three-wire wye, three-wire delta, and single-phase power systems.
2. Equipped with security lock to protect revenue-related metering from unauthorized and accidental changes.
3. Comply with IEC 60529 degree of protection code of IP65 for front of meter, and code of IP30 for body.
4. Overvoltage: Comply with UL 61010-1 overvoltage withstand rating for CAT III.
5. Accuracy: Comply with ANSI C12.20, Class 0.5.
6. Data Link: Ethernet connectivity specified in this article.
7. Meter Physical Characteristics:

   a. Display: Backlit LCD with antiglare and scratch-resistant lens.
   b. Display of Metered Values: One screen to show at least three user-selected values displayed at same time.

8. Sampling Rate: Continuously sample and record voltage and current at rate not less than 64 samples per cycle, simultaneously on voltage and current channels of meter.
9. Meters:

   a. Instantaneous, RMS:

      1) Current: Each phase, neutral and three-phase average.
      2) Voltage: L-L for each phase, L-L three-phase average, L-N each phase, and L-N three-phase average.
      3) Active Power (kW): Each phase and three-phase total.
      4) Reactive Power (kVAR): Each phase and three-phase total.
      5) Apparent Power (kVA): Each phase and three-phase total.
      6) Power Factor: Each phase and three-phase total.

   b. Energy:

      1) Active Energy (kWh): Three-phase total.

   c. Demand, Derived from Instantaneous RMS Meters:

      1) Current: Present and maximum.
      2) Active: Present and maximum.

3) Reactive: Present and maximum.
4) Apparent: Present and maximum/

d. Power Quality Measurements:

1) THD: Current and voltage from measurements simultaneously from same cycle, as can be calculated from specified sampling rate.

10. I/O: Two optically isolated digital outputs for KYZ pulsing or control. Output signal characteristics must be 150 mA at 200 V.

a. KYZ Pulse: Generate standard KYZ pulses for user-defined increment of metered active energy as follows:

1) User-defined pulse output, associated with kWh.
2) User-defined pulse output, associated with kVARh.

11. Capacities and Characteristics:

a. Circuit Connections:

1) Voltage: Measurement auto-ranging, 60 to 400 V (ac rms) L-N. Connect directly to low-voltage (600 V and less) without using voltage transformers. Meter impedance must be 2 MΩ L-L or greater.
2) Overload Tolerance: 1500 V(ac rms) continuously.
3) Current: Connect to instrument-grade current transformer with metering range of 5 mA to 6 A. Overcurrent tolerance of instrument must be 10 A continuous, 50 A for 10 seconds once per hour, and 120 A for one second per hour.
4) Frequency: 45 to 65 Hz.
5) Time: Input from GPS receiver to synchronize internal clock of instrument and to time-synchronize this instrument with network to deviation of not greater than 1ms.

2.11 POWER TRANSFER CONFIGURATIONS

A. Factory-installed and -tested controls of circuit breakers to accomplish automatic transfer controls for switchgear having two power sources.

B. Relays: Comply with IEEE C37.90, types and settings as indicated; with test blocks and plugs.

C. Control Wiring:

1. Factory installed, complete with bundling, lacing, and protection.
2. Provide flexible conductors for 8 AWG and smaller, for conductors across hinges and for conductors for interconnections between shipping units.
3. Install plugs in control wiring at shipping splits.

2.12 DIFFERENTIAL GROUND-FAULT PROTECTION

A. Description: Ground-fault protection system for three-phase, four-wire switchgear having multiple sources must be devised by manufacturer to insure that proper main or tie breaker(s) operate properly in normal and emergency conditions. Switchgear must include additional current transformers, ground-fault relays, interlocks, wiring, and accessories to avoid nuisance tripping of circuit breakers connected to main bus of switchgear. Ensure that the following occurs on main bus:

1. A ground fault at location in switchgear must trip system.
2. Combination of normal current flow and ground-fault current flow must trip system.
3. Circulating currents through neutral due to multiple grounds and sources external to immediate low-voltage power sources may not trip system.
4. System may not trip if there is no ground fault, during normal current flow.
5. System may not trip due to large single-phase currents.

B. Relays: Comply with IEEE C37.90, with test blocks and plugs.

C. Control Wiring:

1. Factory installed, complete with bundling, lacing, and protection.
2. Provide flexible conductors for 8 AWG and smaller, for conductors across hinges and for conductors for interconnections between shipping units.
3. Install plugs in control wiring at shipping splits.

2.13 SOURCE QUALITY CONTROL

A. Factory Tests and Inspections: Test and inspect low-voltage switchgear, by, or under supervision of, qualified electrical testing laboratory recognized by authorities having jurisdiction, in accordance with IEEE C37.20.1 before delivering to site. Affix label with name and date of manufacturer's certification of system compliance on control units. Drawout circuit breakers need not be tested in assembly if they are tested separately.

1. Dielectric Tests: Perform power-frequency withstand tests to demonstrate ability of insulation system to withstand voltages listed in IEEE C37.20.1. Voltage must be increased gradually from zero to required test value within 5 to 10 seconds and must be held at that value for one minute.
2. Perform mechanical operation tests to ensure proper functioning of operating mechanism, mechanical interlocks, and interchangeability of removable elements that are designed to be interchangeable.
3. Test effectiveness of grounding of metal-case instrument transformer frame or case.
4. Verify that control wiring is correct by verifying continuity. Perform electrical operation of component devices to ensure that they function properly and in intended sequence.
5. Perform control wiring insulation tests.
6. Verify correct polarity of connections between instrument transformers and meters and relays.

B. Serial communications devices within equipment must be addressed at factory and tested to verify reliable communications to equipment's Ethernet gateway.

C. Nonconforming Work:

1. Low-voltage switchgear assembly will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install switchgear on cast-in-place 4” high concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 260529 "Hangers and Supports for Electrical Systems."

B. Comply with requirements for vibration isolation and seismic-control devices specified in Section 260529 "Hangers and Supports for Electrical Systems".

C. Maintain minimum clearances and workspace at equipment in accordance with manufacturer's published instructions and NFPA 70.

D. Set and adjust settings in accordance with Section 260572 "Overcurrent Protective Device Short-Circuit Study" and Section 260573.16 "Coordination Studies.

3.2 CONNECTIONS

A. Ground equipment in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

B. Terminate grounding and bonding conductors on common equipment grounding terminal on switchgear enclosure. Install supplemental terminal bars, lugs, and bonding jumpers as required to accommodate number of conductors for termination.

C. Complete switchgear grounding and surge-protector connections prior to making other electrical connections.

3.3 IDENTIFICATION

A. Comply with installation requirements for labels and signs specified in Section 260553 "Identification for Electrical Systems."

B. Install warning signs as required to comply with OSHA 29 CFR 1910.269.

C. Compartment Nameplates: Engraved, laminated-acrylic, as described in Section 260553 "Identification for Electrical Systems," for compartments, mounted with corrosion-resistant screws.

D. Arc-Flash Warning Labels:

1. Comply with requirements in Section 260573.19 "Arc-Flash Hazard Analysis." Produce 3.5 by 5-inch self-adhesive equipment label for work locations included in analysis.

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

B. Field tests and inspections must be witnessed by Campus Representative.

C. Tests and Inspections:

1. Comply with provisions of "Testing and Test Methods" Chapter in NFPA 70B and NETA ATS.
2. After installing switchgear and after electrical circuitry has been energized, test for compliance with requirements.
3. Perform visual and mechanical inspections and electrical tests stated in NETA ATS. Certify compliance with test parameters.
4. Visual and Mechanical Inspection:

a. Verify that fuse and circuit-breaker sizes and types correspond to Drawings and coordination study, as well as to circuit breaker's address in control network.
b. Verify that current and voltage transformer ratios correspond to Drawings.
c. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

d. Confirm correct operation and sequencing of electrical and mechanical interlock systems.

1) Attempt closure on locked-open devices. Attempt to open locked-closed devices.
2) Make key exchange with devices operated in off-normal positions.

e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

f. Inspect insulators for evidence of physical damage or contaminated surfaces.
g. Verify correct barrier and shutter installation and operation.
h. Exercise active components.
i. Inspect mechanical indicating devices for correct operation.
j. Verify that filters are in place and that vents are clear.
k. Perform visual and mechanical inspection of instrument transformers in accordance with "Instrument Transformer Field Tests" Paragraph.
l. Inspect control power transformers.

1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
3) Verify correct functioning of draw-out disconnecting and grounding contacts and interlocks.

5. Electrical Tests:

a. Perform DC voltage insulation-resistance tests on bus sections, phase-to-phase and phase-to-ground, for one minute. If bus temperature is other than plus or minus 20 deg C, adjust resulting resistance as provided in NETA ATS, Table 100.11.

1) Insulation-resistance values of bus insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.
2) Do not proceed to dielectric withstand voltage tests until insulation-resistance levels are raised above minimum values.

b. Perform dielectric withstand voltage test on bus sections, phase-to-ground with phases not under test grounded, in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it must be conducted in accordance with NETA ATS, Table 100.2. Apply test voltage for one minute.

1) If no evidence of distress or insulation failure is observed by end of total time of voltage application during dielectric withstand test, test specimen is considered to have passed test.

c. Perform insulation-resistance tests on control wiring for ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid-state components or control devices that cannot tolerate applied voltage, follow manufacturer's published instruction.

1) Minimum insulation-resistance values of control wiring may not be less than 2 MΩ.

d. Control Power Transformers:

1) Perform insulation-resistance tests. Perform measurements from winding-to-winding and windings-to-ground. Insulation-resistance values of winding insulation must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.1.
2) Perform secondary wiring integrity test. Disconnect transformer at secondary terminals and connect secondary wiring to rated secondary voltage source. Verify correct potential at devices.
3) Verify correct secondary voltage by energizing primary winding with system voltage. Measure secondary voltage with secondary wiring disconnected.
4) Verify correct function of control transfer relays located in switchgear with multiple control power sources.

e. Voltage Transformers:

1) Perform secondary wiring integrity test. Verify correct potential at devices.
2) Verify secondary voltages by energizing primary winding with system voltage.

f. Perform current-injection tests on entire current circuit in switchgear sections.

1) Perform current tests by secondary injection with magnitudes such that minimum 1.0 A current flows in secondary circuit. Verify correct magnitude of current at devices in circuit.

g. Perform system function tests in accordance with "System Function Tests" Paragraph.
h. Verify operation of space heaters.
i. Perform phasing checks on double-ended or dual-source switchgear to ensure correct bus phasing from sources.

D. Circuit-Breaker Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect anchorage, alignment, and grounding.
c. Verify that maintenance devices are available for servicing and operating breaker.
d. Verify unit is clean.
e. Verify that arc chutes are intact.
f. Inspect moving and stationary contacts for condition and alignment.
g. Verify that primary and secondary contact wipe and other dimensions vital to satisfactory operation of breaker are correct.
h. Perform mechanical operator and contact alignment tests on both breaker and its operating mechanism in accordance with manufacturer's published data.
i. Verify cell fit and element alignment.
j. Verify racking mechanism operation.

k. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
l. Perform adjustments for final protective-device settings in accordance with coordination study provided by Owner.
m. Record as-found and as-left operation counter readings.

2. Electrical Tests:

a. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to ground with switch closed, and across open poles. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.1. Insulation-resistance values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.1. Values of insulation resistance less than Table 100.1 or manufacturer's published instructions must be investigated.
b. Measure contact resistance across power contacts of circuit breakers. Drop values for μΩ or mV(dc) may not exceed high levels of normal range as indicated in manufacturer's published data. In absence of manufacturer's published data, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
c. Determine long-time pickup and delay by primary current injection. Long-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors. If manufacturer's curves are unavailable, trip times may not exceed value shown in NETA ATS, Table 100.7.
d. Determine short-time pickup and delay by primary current injection. Short-time pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
e. Determine ground-fault pickup and delay by primary current injection. Ground-fault pickup values must be as specified, and trip characteristic may not exceed manufacturer's published time-current tolerance band.
f. Determine instantaneous pickup value by primary current injection. Instantaneous pickup values must be as specified and within manufacturer's published tolerances. In absence of manufacturer's published data, comply with NETA ATS, Table 100.8.
g. Test functions of trip unit by means of secondary injection. Pickup values and trip characteristic must be as specified and within manufacturer's published tolerances.
h. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of shunt trip and close coils must comply with manufacturer's published data. In absence of manufacturer's published data, comply with NETA ATS, Table 100.20.
i. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
j. Verify correct operation of auxiliary features, such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free operation, anti pump function, and trip-unit battery condition. Reset trip logs and indicators. Auxiliary features must operate in accordance with manufacturer's published data.

k. Verify operation of charging mechanism. Charging mechanism must operate in accordance with manufacturer's published data.

E. Instrument Transformer Field Tests:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data complies with Contract Documents.
b. Inspect physical and mechanical condition.
c. Verify correct connection of transformers with system requirements.
d. Verify that adequate clearances exist between primary and secondary circuit wiring.
e. Verify that unit is clean.
f. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

g. Verify that required grounding and shorting connections provide contact.
h. Verify correct operation of transformer withdrawal mechanism and grounding operation.
i. Verify correct primary and secondary fuse sizes for voltage transformers.
j. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.

2. Electrical Tests of Current Transformers:

a. Perform insulation-resistance test of current transformers and secondary wiring for ground at 1000 V(dc) for one minute. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.
b. Perform polarity test on current transformers in accordance with IEEE C57.13.1. Polarity results must agree with transformer markings.
c. Perform ratio-verification test using voltage or current method in accordance with IEEE C57.13.1. Ratio errors must be in accordance with IEEE C57.13.
d. Perform excitation test on transformers used for relaying applications in accordance with IEEE C57.13.1. Excitation results must match curve supplied by manufacturer or be in accordance with IEEE C57.13.1.
e. Measure current circuit burdens at transformer terminals in accordance with IEEE C57.13.1. Measured burdens must be compared to, and must match, instrument transformer ratings.

f. Perform insulation-resistance tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.5.
g. Perform dielectric withstand tests on primary winding with secondary grounded. Test voltages must be in accordance with NETA ATS, Table 100.9.
h. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data.
i. Verify that current transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. That grounding point should be located as specified by Engineer in Project Drawings.

3. Electrical Tests of Voltage Transformers:

a. Perform insulation-resistance tests, winding-to-winding and windings-to-ground. Test voltages must be applied for one minute in accordance with NETA ATS Table 100.5. For units with solid-state components that cannot tolerate applied voltage, follow manufacturer's published instructions. Investigate and correct values of insulation resistance less than manufacturer's published instructions or NETA ATS, Table 100.5.
b. Perform polarity test on transformers to verify polarity marks or H1-X1 relationship as applicable. Polarity results must agree with transformer markings.
c. Perform turns-ratio test on tap positions. Ratio errors must be in accordance with IEEE C57.13.
d. Measure voltage circuit burdens at transformer terminals. Measured burdens must be compared to, and must match, instrument transformer ratings.
e. Perform power-factor or dissipation-factor tests in accordance with test equipment manufacturer's published data. Power-factor or dissipation-factor values must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use test equipment manufacturer's published data.
f. Verify that voltage transformer secondary circuits are grounded and have only one grounding point in accordance with IEEE C57.13.3. Test results must indicate that circuits are grounded at only one point.

F. Ground-Resistance Test:

1. Visual and Mechanical Inspection:

a. Verify that ground system complies with Contract Documents and with Article 250, "Grounding and Bonding," in NFPA 70.
b. Inspect physical and mechanical condition. Grounding system electrical and mechanical connections must be free of corrosion.
c. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with

manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

d. Inspect anchorage.

2. Electrical Tests:

a. Perform fall-of-potential or alternative test in accordance with IEEE 81 on main grounding electrode or system. Resistance between main grounding electrode and ground must be no more than 5 Ω].
b. Perform point-to-point tests to determine resistance between main grounding system and major electrical equipment frames, system neutral, and derived neutral points. Investigate point-to-point resistance values that exceed 0.5 Ω. Compare equipment nameplate data with the Contract Documents.
c. Inspect physical and mechanical condition.
d. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

G. Metering Devices Field Tests:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect bolted electrical connections for high resistance using one of the following two methods:

1) Use low-resistance ohmmeter to compare bolted-connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.
2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS, Table 100.12. Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS, Table 100.12.

c. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case shorting contacts, as applicable.
d. Verify that unit is clean.
e. Verify freedom of movement, end play, and alignment of rotating disk(s).

2. Electrical Tests:

   a. Verify accuracy of meters at cardinal points. Meter accuracy must be in accordance with manufacturer's published data.
   b. Calibrate meters in accordance with manufacturer's published data. Calibration results must be within manufacturer's published tolerances.
   c. Verify instrument multipliers. Instrument multipliers must be in accordance with system design specifications.
   d. Verify that current transformer and voltage transformer secondary circuits are intact. Test results must confirm integrity of secondary circuits of current and voltage transformers.

H. Microprocessor-Based Protective Relay Field Tests:

1. Visual and Mechanical Inspection:

   a. Record model number, style number, serial number, firmware revision, software revision, and rated control voltage.
   b. Verify operation of LEDs, display, and targets.
   c. Record passwords for each access level.
   d. Clean front panel and remove foreign material from case.
   e. Check tightness of connections.
   f. Verify that frame is grounded in accordance with manufacturer's published instructions.
   g. Set relay in accordance with results in Section 260573.16 "Coordination Studies" and in Section 260573.19 "Arc-Flash Hazard Analysis."
   h. Download settings from relay. Print copy of settings for report and compare settings to those specified in coordination study.

2. Electrical Tests:

   a. Perform insulation-resistance tests from circuits to grounded frame in accordance with manufacturer's published data.
   b. Apply voltage or current to analog inputs, and verify correct registration of relay meter functions.
   c. Check functional operation of elements used in protection scheme as follows:

      1) ANSI No. 2/62, Timing Relay:

         a) Determine time delay.
         b) Verify operation of instantaneous contacts.

      2) ANSI No. 24, Volts/Hertz Relay:

         a) Determine pickup frequency at rated voltage.
         b) Determine pickup frequency at second voltage level.
         c) Determine time delay.

      3) ANSI No. 25, Sync Check Relay:

         a) Determine closing zone at rated voltage.

b) Determine maximum voltage differential that permits closing at zero degrees.
c) Determine set points of live line, live bus, dead line, and dead bus.
d) Determine time delay.
e) Verify control functions of dead bus/live line, dead line/live bus, and dead bus/dead line.

4) ANSI No. 27, Undervoltage Relay:

a) Determine dropout voltage.
b) Determine time delay.
c) Determine time delay at second point on timing curve for inverse time relays.

5) ANSI No. 32, Directional Power Relay:

a) Determine minimum pickup at maximum torque angle.
b) Determine closing zone.
c) Determine maximum torque angle.
d) Determine time delay.
e) Verify time delay at second point on timing curve for inverse time relays.

6) ANSI No. 46, Current Balance Relay:

a) Determine pickup of unit.
b) Determine percent slope.
c) Determine time delay.

7) ANSI No. 46N, Negative Sequence Current Relay:

a) Determine negative sequence alarm level.
b) Determine negative sequence minimum trip level.
c) Determine maximum time delay.
d) Verify two points on I^2T curve.

8) ANSI No. 47, Phase Sequence or Phase Balance Voltage Relay:

a) Determine positive sequence voltage to close N.O. contact.
b) Determine positive sequence voltage to open N.C. contact (undervoltage trip).
c) Verify negative sequence trip.
d) Determine time delay to close N.O. contact with sudden application of 120 percent of pickup.
e) Determine time delay to close N.C. contact on removal of voltage when previously set to rated system voltage.

9) ANSI No. 50, Instantaneous Overcurrent Relay:

a) Determine pickup.
b) Determine dropout.

10) ANSI No. 51, Time Overcurrent:

a) Determine minimum pickup.
b) Determine time delay at two points on time current curve.

11) ANSI No. 64, Ground Detector Relay:

a) Determine maximum impedance to ground causing relay pickup.

12) ANSI No. 67, Directional Overcurrent Relay:

a) Determine directional unit minimum pickup at maximum torque angle.
b) Determine closing zone.
c) Determine overcurrent unit pickup.
d) Determine overcurrent unit time delay at two points on time current curve.

13) ANSI No. 87, Differential Relay:

a) Determine operating unit pickup.
b) Determine operation of restraint unit.
c) Determine slope.
d) Determine harmonic restraint.
e) Determine instantaneous pickup.

d. Control Verification:

1) Functional Tests:

a) Check operation of active digital inputs.
b) Check output contacts or SCRs, preferably by operating controlled device, such as circuit breaker, auxiliary relay, or alarm.
c) Check internal logic functions used in protection scheme.
d) On completion of testing, reset minimum/maximum recorders, communications statistics, fault counters, sequence-of-events recorder, and event records.

2) In-Service Monitoring: After equipment is initially energized, measure magnitude and phase angle of inputs and verify expected values.

I. Ground-Fault Protection Field Tests: Evaluate interconnected system in accordance with switchgear manufacturer's published instructions.

1. Determine proper location of sensors around bus of circuit to be protected. This determination may be done visually, with knowledge of which bus is involved.
2. Verify grounding points of system to determine that ground paths do not exist that would bypass sensors. Use high-voltage testers and resistance bridges.
3. Test installed system for correct response by application of full-scale current into equipment to duplicate ground-fault condition, or by equivalent means such as by simulated fault current generated by the following:

a. A coil around sensors.
b. A separate test winding in sensors.

4. Record test results on test form provided with instructions provided by manufacturer.

J. DC System Vented NiCd Batteries Field Test:

1. Visual and Mechanical Inspection:

a. Verify that batteries are adequately located.
b. Verify that battery area ventilation system is operable.
c. Verify existence of suitable eyewash equipment.
d. Verify that equipment nameplate data complies with the Contract Documents.
e. Inspect physical and mechanical condition.
f. Verify adequacy of battery support racks, mounting, anchorage, alignment, grounding, and clearances.
g. Verify electrolyte level. Measure pilot-cell electrolyte temperature, and correct as recommended by manufacturer's maintenance procedures to bring temperature and electrolyte level to within normal limits.
h. Verify that units are clean.
i. Inspect spill containment installation.
j. Verify application of oxide inhibitor on battery terminal connections.

2. Electrical Tests:

a. Measure charger float and equalizing voltage levels. Adjust to battery manufacturer's recommended levels.
b. Verify charger functions and verify that alarms comply with system manufacturer's published instructions.
c. Measure cell voltage and total battery voltage with charger energized and in float mode of operation. Cell voltages must be within 0.05 V of each other or in accordance with manufacturer's published data.
d. Measure intercell connection resistances.
e. Perform internal ohmic measurement tests. Cell internal ohmic values (resistance, impedance, or conductance) may not vary by more than 25 percent between identical cells that are in fully charged state.
f. Perform load test in accordance with manufacturer's published data or IEEE 1106. Replace units that fail to pass test.
g. Measure battery system voltage from positive-to-ground and negative-to-ground. Voltage measured from positive-to-ground must be equal in magnitude to voltage measured from negative-to-ground.

K. System Function Tests: Perform system function tests after other field quality-control tests have been completed and components have passed specified tests. Verify correct interaction of sensing, processing, and action devices.

1. Develop test parameters and perform tests for purpose of evaluating performance of integral components and their functioning as complete unit within design requirements and manufacturer's published data.

2. Verify correct operation of interlock safety devices for fail-safe functions in addition to design function.
3. Verify correct operation of sensing devices, alarms, and indicating devices.

L. Nonconforming Work:

1. Switchgear components will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

M. Collect, assemble, and submit test and inspection reports. Record as-left set points of adjustable devices.

N. Manufacturer Services:

1. Engage factory-authorized service representative to support and supervise field tests and inspections.

3.5 MAINTENANCE

A. Voltage Monitoring and Adjusting: After Substantial Completion, but not more than six months after Final Acceptance, and if requested by Owner, perform the following voltage monitoring:

1. During period of normal load cycles as evaluated by Owner, perform seven days of three-phase voltage recording at switchgear outgoing sections. Use voltmeters with calibration traceable to NIST standards and with chart speed of not less than 1 inch per hour. Voltage unbalance greater than 1 percent between phases, or deviation of phase voltage from nominal value by more than plus or minus 5 percent during test period, is unacceptable.
2. Corrective Action: If test results are unacceptable, perform corrective action.
3. Retests: Repeat monitoring, after corrective action has been performed, until specified results are obtained.
4. Report:

   a. Prepare published report covering monitoring performed and corrective action taken.

B. Infrared Inspection: Perform survey during periods of maximum possible loading. Remove covers prior to inspection.

1. After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared inspection of electrical power connections of switchgear.
2. Instrument: Inspect distribution systems with imaging equipment capable of detecting minimum temperature difference of 1 deg C at 30 deg C.
3. Record of Infrared Inspection: Prepare certified report that identifies testing technician and equipment used and that lists results.
4. Act on inspection results in accordance with recommendations in NETA ATS, Table 100.18. Correct possible and probable deficiencies as soon as Owner's operations permit. Retest until deficiencies are corrected.
5. Follow-up Infrared Scanning: Perform additional follow-up infrared scan of switches 13 months after date of Substantial Completion.

C. Software and Firmware Service Agreement:

END OF SECTION 262300

SECTION 262413 - SWITCHBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Switchboards.
2. Surge protection devices.
3. Disconnecting and overcurrent protective devices.
4. Instrumentation.
5. Control power.
6. Accessory components and features.

1.2 ACTION SUBMITTALS

A. Product Data:

1. Switchboards.
2. Overcurrent protective devices.
3. Surge protection devices.
4. Ground-fault protection devices.
5. Accessories.
6. Other components.
7. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.

B. Shop Drawings: For each switchboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details, including required clearances and service space around equipment. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types for types other than UL 50E, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Detail short-circuit current rating of switchboards and overcurrent protective devices.
5. Detail utility company's metering provisions with indication of approval by utility company.
6. Include evidence of listing, by qualified electrical testing laboratory recognized by authorities having jurisdiction, for series rating of installed devices.
7. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in switchboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device.

9. Include diagram and details of proposed mimic bus.
10. Include schematic and wiring diagrams for power, signal, and control wiring.

C. Field Quality-Control Submittals:

1. Field Quality-Control Reports:

a. Test procedures used.
b. Test results that comply with requirements.
c. Results of failed tests and corrective action taken to achieve test results that comply with requirements.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions: Record copy of official installation and testing instructions issued to Installer by manufacturer for the following:

1. Handling, storing, and providing temporary heat.
2. Mounting accessories and anchoring devices.
3. Testing and adjusting overcurrent protective devices.

B. Sample warranties.

1.4 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Spare Parts: Furnish to Owner spare parts, for repairing switchboards, that are packaged with protective covering for storage on-site and identified with labels describing contents. Include the following:

1. Potential Transformer Fuses: Equal to 10 percent of quantity installed for each size and type but no fewer than two of each size and type.
2. Control-Power Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.
3. Fuses and Fusible Devices for Fused Circuit Breakers: Equal to 10 percent of quantity installed for each size and type but no fewer than three of each size and type.
4. Fuses for Fused Switches: Equal to 10 percent of quantity installed for each size and type but no fewer than three of each size and type.
5. Fuses for Fused Power-Circuit Devices: Equal to 10 percent of quantity installed for each size and type but no fewer than three of each size and type.
6. Indicating Lights: Equal to 10 percent of quantity installed for each size and type but no less than one of each size and type.

B. Special Tools: Furnish to Owner proprietary equipment, keys, and software required to operate, maintain, repair, adjust, or implement future changes to switchboards, that are packaged with protective covering for storage on-site and identified with labels describing contents.
   1. Spare-Fuse Cabinet: Suitably identified, wall-mounted, lockable, compartmented steel box or cabinet. Arrange for wall mounting.

1.6 WARRANTY

A. Special Installer Extended Warranty: Installer warrants that fabricated and installed switchboard perform in accordance with specified requirements and agrees to repair or replace components that fail to perform as specified within extended-warranty period.

   1. Extended-Warranty Period: Three years from date of Substantial Completion; full coverage for labor, materials, and equipment.

B. Special Manufacturer Extended Warranty: Manufacturer warrants that switchboard performs in accordance with specified requirements and agrees to provide repair or replacement of components that fail to perform as specified within extended-warranty period.

   1. Extended-Warranty Period: Five years from date of Substantial Completion; prorated coverage for labor, materials, and equipment.
   2. Follow-On Extended-Warranty Period: Five years from date of Substantial Completion; full coverage for materials that failed because of transient voltage surges only, free on board destination, freight prepaid.

PART 2 - PRODUCTS

2.1 SWITCHBOARDS

A. <u>As Manufactured by Square-D,</u> or approved equal by:

   1. Eaton
   2. Siemens

B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for switchboards including clearances between switchboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

C. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

D. Comply with NEMA PB 2.

E. Comply with NFPA 70.

F. Comply with UL 891.

G. Front-Connected, Front-Accessible Switchboards:

1. Main Devices: Panel mounted.
2. Branch Devices: Panel mounted.
3. Sections front and rear aligned.

H. Nominal System Voltage: 480Y/277 V and 208Y/120 V, as indicated on plans.

I. Main-Bus Continuous: As indicated on plans.

J. Indoor Enclosures: Steel, UL 50E, Type 1

K. Enclosure Finish for Indoor Units: Factory-applied finish in manufacturer's standard gray finish over rust-inhibiting primer on treated metal surface.

L. Hinged Front Panels: Allow access to circuit breaker, metering, accessory, and blank compartments.

M. Pull Box on Top of Switchboard:

1. Adequate ventilation to maintain temperature in pull box within same limits as switchboard.
2. Set back from front to clear circuit-breaker removal mechanism.
3. Removable covers may form top, front, and sides. Top covers at rear must be easily removable for drilling and cutting.
4. Bottom must be insulating, fire-resistive material with separate holes for cable drops into switchboard.
5. Cable supports must be arranged to facilitate cabling and adequate to support cables indicated, including those for future installation.

N. Buses and Connections: Three phase, four wire unless otherwise indicated.

1. Provide phase bus arrangement A, B, C from front to back, top to bottom, and left to right when viewed from front of switchboard.
2. Load Terminals: Insulated, rigidly braced, runback bus extensions, of same material as through buses, equipped with mechanical connectors for outgoing circuit conductors. Provide load terminals for future circuit-breaker positions at full-ampere rating of circuit-breaker position.
3. Ground Bus: 1/4 by 2 inch hard-drawn copper of 98 percent conductivity, equipped with mechanical connectors for feeder and branch-circuit ground conductors.
4. Main-Phase Buses and Equipment-Ground Buses: Uniform capacity for entire length of switchboard's main and distribution sections. Provide for future extensions from both ends.
5. Disconnect Links:

a. Isolate neutral bus from incoming neutral conductors.

b. Bond neutral bus to equipment-ground bus for switchboards utilized as service equipment or separately derived systems.

6. Neutral Buses: 100 percent of ampacity of phase buses unless otherwise indicated, equipped with mechanical connectors for outgoing circuit neutral cables. Brace bus extensions for busway feeder neutral bus.

O. Future Devices: Equip compartments with mounting brackets, supports, bus connections, and appurtenances at full rating of circuit-breaker compartment.

2.2 SURGE PROTECTION DEVICES

A. SPDs: Listed and labeled in accordance with UL 1449, Type 1.

B. Features and Accessories:

1. Integral disconnect switch.
2. Internal thermal protection that disconnects SPD before damaging internal suppressor components.
3. Indicator light display for protection status.
4. Form-C contacts rated at 2 A and 24 V(ac), one normally open and one normally closed, for remote monitoring of protection status. Contacts must reverse on failure of surge diversion module or on opening of current-limiting device. Coordinate with building power monitoring and control system.
5. Surge counter.

C. Peak Surge Current Rating: Minimum single-pulse surge current withstand rating per phase may not be less than 200 kA. Peak surge current rating must be arithmetic sum of ratings of individual MOVs in each mode.

D. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, 208Y/120 V, three-phase, four-wire circuits may not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V, 700 V for 208Y/120 V.
2. Line to Ground: 1200 V for 480Y/277 V,. 1200 V for 208Y/120 V.
3. Line to Line: 2000 V for 480Y/277 V, 1000 V for 208Y/120 V.

E. SCCR: Equal or exceed200 kA .

F. Nominal Rating: 20 kA.

2.3 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with series-connected rating, interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes up to 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with RMS sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long and short time adjustments.
    d. Ground-fault pickup level, time delay, and I squared t response.

4. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
5. Integrally Fused Circuit Breakers: Thermal-magnetic trip element with integral limiter-style fuse listed for use with circuit breaker; trip activation on fuse opening or on opening of fuse compartment door.
6. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6 mA trip).
7. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30 mA trip).
8. MCCB Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor material.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
    e. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
    f. Communication Capability: Universal-mounted communication module with functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
    g. Shunt Trip: 120 V trip coil energized from separate circuit, set to trip at 75 percent of rated voltage.
    h. Undervoltage Trip: Set to operate at 35 to 75 percent of rated voltage without intentional time delay.
    i. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.
    j. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key must be removable only when circuit breaker is in off position.

B. Insulated-Case Circuit Breaker (ICCB): 80percent rated, sealed, insulated-case power circuit breaker with interrupting capacity rating to meet available fault current.

1. Drawout circuit-breaker mounting.
2. Two-step, stored-energy closing.
3. Full-function, microprocessor-based trip units with interchangeable rating plug, trip indicators, and the following field-adjustable settings:

   a. Instantaneous trip.
   b. Time adjustments for long- and short-time pickup.
   c. Ground-fault pickup level, time delay, and I squared t response.

4. Zone-Selective Interlocking: Integral with electronic trip unit; for interlocking ground-fault protection function.
5. Remote trip indication and control.
6. Communication Capability: Web enabled integral Ethernet communication module and embedded Web server with factory-configured Web pages (HTML file format). Provide functions and features compatible with power monitoring and control system specified in Section 260913 "Electrical Power Monitoring and Control."
7. Key Interlock Kit: Externally mounted to prohibit circuit-breaker operation; key must be removable only when circuit breaker is in off position.
8. Control Voltage: 120 V(ac).

C. Bolted-Pressure Contact Switch: Operating mechanism uses rotary-mechanical-bolting action to produce and maintain high clamping pressure on switch blade after it engages stationary contacts.

1. Main-Contact Interrupting Capability: Minimum of 12 times switch current rating.
2. Operating Mechanism: Manual handle operation to close switch; stores energy in mechanism for opening and closing.

   a. Electrical Trip: Operation of lever or push-button trip switch, or trip signal from ground-fault relay or remote-control device, causes switch to open.
   b. Mechanical Trip: Operation of mechanical lever, push button, or other device causes switch to open.

3. Auxiliary Switches: Factory installed, SPDT, with leads connected to terminal block, and including one set more than quantity required for functional performance indicated.

D. High-Pressure, Butt-Type Contact Switch: Operating mechanism uses butt-type contacts and spring-charged mechanism to produce and maintain high-pressure contact when switch is closed.

1. Main-Contact Interrupting Capability: Minimum of 12 times switch current rating.
2. Operating Mechanism: Manual handle operation to close switch; stores energy in mechanism for opening and closing.

   a. Electrical Trip: Operation of lever or push-button trip switch, or trip signal from ground-fault relay or remote-control device, causes switch to open.
   b. Mechanical Trip: Operation of mechanical lever, push button, or other device causes switch to open.

3. Auxiliary Switches: Factory installed, SPDT, with leads connected to terminal block, and including one set more than quantity required for functional performance indicated.

E. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

2.4 INSTRUMENTATION

A. Instrument Transformers: NEMA EI 21.1, and the following:

1. Potential Transformers: NEMA EI 21.1; 120 V, 60 Hz, double secondary; disconnecting type with integral fuse mountings. Burden and accuracy must be consistent with connected metering and relay devices.
2. Current Transformers: NEMA EI 21.1; 5 A, 60 Hz, secondary; bushing type; double secondary winding and secondary shorting device. Burden and accuracy must be consistent with connected metering and relay devices.
3. Control-Power Transformers: Dry type, mounted in separate compartments for units larger than 3 kVA.
4. Current Transformers for Neutral and Ground-Fault Current Sensing: Connect secondary wiring to ground overcurrent relays, via shorting terminals, to provide selective tripping of main and tie circuit breaker. Coordinate with feeder circuit-breaker, ground-fault protection.

B. Multifunction Digital-Metering Monitor: Microprocessor-based unit suitable for three- or four-wire systems and with the following features:

1. Switch-selectable digital display of the following values with maximum accuracy tolerances as indicated:

   a. Phase Currents, Each Phase: Plus or minus 0.5 percent.
   b. Phase-to-Phase Voltages, Three Phase: Plus or minus 0.5 percent.
   c. Phase-to-Neutral Voltages, Three Phase: Plus or minus 0.5 percent.
   d. Megawatts: Plus or minus 1 percent.
   e. Megavars: Plus or minus 1 percent.
   f. Power Factor: Plus or minus 1 percent.
   g. Frequency: Plus or minus 0.1 percent.
   h. Accumulated Energy, Megawatt Hours: Plus or minus 1 percent; accumulated values unaffected by power outages up to 72 hours.
   i. Megawatt Demand: Plus or minus 1 percent; demand interval programmable from five to 60 minutes.
   j. Contact devices to operate remote impulse-totalizing demand meter.

2. Mounting: Display and control unit flush or semi-flush mounted in instrument compartment door.

C. Watt-Hour Meters and Watt meters:

1. Comply with ANSI C12.1.

2. Three-phase induction type with two stators, each with current and potential coil, rated 5 A, 120 V, 60 Hz.
3. Suitable for connection to three- and four-wire circuits.
4. Potential indicating lamps.
5. Adjustments for light and full load, phase balance, and power factor.
6. Four-dial clock register.
7. Ratchets to prevent reverse rotation.
8. Removable meter with drawout test plug.
9. Semi-flush mounted case with matching cover.
10. Appropriate multiplier tag.

D. Impulse-Totalizing Demand Meter:

1. Comply with ANSI C12.1.
2. Suitable for use with switchboard watt-hour meter, including two-circuit totalizing relay.
3. Cyclometer.
4. Four-dial, totalizing kilowatt-hour register.
5. Positive chart drive mechanism.
6. Capillary pen holding minimum of one month's ink supply.
7. Roll chart with minimum 31-day capacity; appropriate multiplier tag.
8. Capable of indicating and recording 15 minute integrated demand of totalized system.

2.5 CONTROL POWER

A. Control Circuits: 120 V(ac), supplied through secondary disconnecting devices from control-power transformer.

B. Electrically Interlocked Main and Tie Circuit Breakers: Two control-power transformers in separate compartments, with interlocking relays, connected to primary side of each control-power transformer at line side of associated main circuit breaker. 120 V secondaries connected through automatic transfer relays to ensure fail-safe automatic transfer scheme.

C. Control-Power Fuses: Primary and secondary fuses for current-limiting and overload protection of transformer and fuses for protection of control circuits.

D. Control Wiring: Factory installed, with bundling, lacing, and protection included. Provide flexible conductors for 8 AWG and smaller, for conductors across hinges, and for conductors for interconnections between shipping units.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's published instructions.

B. Reference Standards:

1. Switchboards and Accessories: Unless more stringent requirements are specified in Contract Documents or manufacturers' published instructions, comply with NECA 400 and NEMA PB 2.1.
2. Consult Architect for resolution of conflicting requirements.

C. Special Techniques:

1. Equipment Mounting: Install switchboards on concrete base, 4-inch nominal thickness. Comply with requirements for concrete base specified in Section 260529 "Hangers and Supports for Electrical Systems."

    a. Install conduits entering underneath switchboard, entering under vertical section where conductors will terminate. Install with couplings flush with concrete base. Extend 2-inch above concrete base after switchboard is anchored in place.
    b. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of concrete base.
    c. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
    d. Place and secure anchorage devices. Use setting drawings, templates, diagrams, published instructions, and directions furnished with items to be embedded.
    e. Install anchor bolts to elevations required for proper attachment to switchboards.
    f. Anchor switchboard to building structure at top of switchboard if required or recommended by manufacturer.

2. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, straps and brackets, and temporary blocking of moving parts from switchboard units and components.
3. Operating Instructions: Frame and mount printed basic operating instructions for switchboards, including control and key interlocking sequences and emergency procedures. Fabricate frame of finished wood or metal and cover instructions with clear acrylic plastic. Mount on front of switchboards.
4. Install filler plates in unused spaces of panel-mounted sections.
5. Install overcurrent protective devices, surge protection devices, and instrumentation.

    a. Set field-adjustable switches and circuit-breaker trip ranges.

6. Install spare-fuse cabinet.

3.2 CONNECTIONS

A. Comply with requirements for terminating feeder bus specified in Section 262500 "Enclosed Bus Assemblies." Drawings indicate general arrangement of bus, fittings, and specialties.

B. Bond conduits entering underneath switchboard to equipment ground bus with bonding conductor sized in accordance with NFPA 70.

C. Support and secure conductors within switchboard in accordance with NFPA 70.

D. Extend insulated equipment grounding cable to busway ground connection and support cable at intervals in vertical run.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

B. Switchboard Nameplates: Label each switchboard compartment with nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

C. Device Nameplates: Label each disconnecting and overcurrent protective device and each meter and control device mounted in compartment doors with nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Set and adjust settings in accordance with Section 260572 "Overcurrent Protective Device Short-Circuit Study" and Section 260573.16 "Coordination Studies.

3.4 FIELD QUALITY CONTROL

A. Acceptance Testing Preparation:

B. Field tests and inspections must be witnessed by Campus Representative

C. Tests and Inspections:

1. Acceptance Testing:

   a. Test insulation resistance for each switchboard bus, component, connecting supply, feeder, and control circuit. Open control and metering circuits within switchboard and remove neutral connection to surge protection and other electronic devices prior to insulation test. Reconnect after test.
   b. Test continuity of each circuit.

2. Test ground-fault protection of equipment for service equipment in accordance with NFPA 70.
3. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
4. Correct malfunctioning units on-site where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
5. Perform the following infrared scan tests and inspections, and prepare reports:

   a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform infrared scan of each switchboard. Remove front panels so joints and connections are accessible to portable scanner.

b. Follow-up Infrared Scanning: Perform additional follow-up infrared scan of each switchboard 11 months after date of Substantial Completion.

c. Instruments and Equipment:

1) Use infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.

6. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.

D. Nonconforming Work:

1. Switchboard will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

E. Collect, assemble, and submit test and inspection reports, including certified report that identifies switchboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

F. Manufacturer Services:

1. Engage factory-authorized service representative to support and supervise field tests and inspections.

END OF SECTION 262413

SECTION 262716 - ELECTRICAL CABINETS AND ENCLOSURES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cabinets and cutout boxes.
2. Miscellaneous enclosures.

B. Products Installed, but Not Furnished, under This Section:

1. See Section 260553 "Identification for Electrical Systems" for equipment labels.

1.2 DEFINITIONS

A. RBB: Rack bonding busbar, located in equipment cabinets and racks.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Cabinets and cutout boxes.
2. Termination boxes.
3. Miscellaneous enclosures.

B. Shop Drawings:

1. Shop drawings for custom enclosures and cabinets.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturers' Published Instructions:

1. Cabinets and cutout boxes.
2. Termination boxes.
3. Miscellaneous enclosures.

PART 2 - PRODUCTS

2.1 CABINETS AND CUTOUT BOXES

A. Performance Criteria:

1. Regulatory Requirements:

    a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Listing Criteria:

    a. UL CCN CYIV.
    b. Non-Environmental Characteristics: UL 50.
    c. Environmental Characteristics: UL 50E.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL CYIV - Indoor Sheet Metal Cabinets:

1. General Characteristics: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.
2. Options:

    a. Degree of Protection: Type 1, Type 2, Type 5, Type 12

D. UL CYIV - Indoor Sheet Metal Cutout Boxes:

1. General Characteristics: Enclosure that has swinging doors or covers secured directly to and telescoping with walls of enclosure.
2. Options:

    a. Degree of Protection: Type 1, Type 2, Type 5, Type 12

E. UL CYIV - Outdoor Sheet Metal Cabinets:

1. General Characteristics: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.
2. Options:

    a. Degree of Protection: Type 3R, Type 4, Type 4X

F. UL CYIV - Outdoor Sheet Metal Cutout Boxes:

1. General Characteristics: Enclosure that has swinging doors or covers secured directly to and telescoping with walls of enclosure.
2. Options:

    a. Degree of Protection: Type 3R, Type 4, Type 4X.

2.2 MISCELLANEOUS ENCLOSURES

A. Performance Criteria:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. Listing Criteria:

a. UL CCN XCKT; including UL 1773.
b. Non-Environmental Characteristics: UL 50.
c. Environmental Characteristics: UL 50E.

B. Source Quality Control:

1. Product Data: Prepare and submit catalog cuts, brochures, and performance data illustrating size, physical appearance, and other characteristics of product.
2. Manufacturer's Published Instructions: Prepare and submit installation, testing, and operating instructions for product.

C. UL XCKT - Indoor Sheet Metal Miscellaneous Enclosures:

1. Options:

a. Degree of Protection: Type 2, Type 12.

D. UL XCKT - Outdoor Sheet Metal Miscellaneous Enclosures:

1. Options:

a. Degree of Protection: Type 3R, Type 4, Type 4X.

PART 3 - EXECUTION

3.1 PREPARATION

A. Shop Drawings: Prepare and submit the following:

1. Shop Drawings for Custom Enclosures and Cabinets: Include plans, elevations, sections, and attachment details.
2. Shop Drawings for Racks or Frames:

a. Include plans, elevations, sections, details, and attachments to other work.
b. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
c. Include workspace requirements and access for cable connections.

d. Grounding: Indicate location of RBB and its mounting detail showing standoff insulators and wall-mounting brackets.

3.2 SELECTION OF ELECTRICAL CABINETS AND ENCLOSURES

A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of electrical cabinets and enclosures. Consult Architect for resolution of conflicting requirements.

B. Degree of Protection:

1. Outdoors:

a. Type 3R, Type 4 unless otherwise indicated.
b. Locations Exposed to Hose down: Type 4, Type 6.
c. Locations Subject to Potential Flooding: Type 6P.
d. Locations Aboveground Where Mechanism Must Operate When Ice Covered: Type 3S.
e. Locations in-Ground or Exposed to Corrosive Agents: Type 4X, Type 3RX.
f. Locations in-Ground or Exposed to Corrosive Agents Where Mechanism Must Operate When Ice Covered: Type 3SX.

2. Indoors:

a. Type 1 unless otherwise indicated.
b. Damp or Dusty Locations: Type 12, Type 2, Type 4, Type 5.
c. Surface Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
d. Flush Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12, Type 12K.
e. Locations Exposed to Airborne Dust, Lint, Fibers, or Flyings: Type 4, Type 6.
f. Locations Exposed to Hose down: Type 4, Type 6, Type 6P.
g. Locations Exposed to Brief Submersion: Type 6, Type 6P.
h. Locations Exposed to Prolonged Submersion: Type 6P.
i. Locations Exposed to Corrosive Agents: Type 4X, Type 6P.
j. Locations Exposed to Spraying Oil or Coolants: Type 13.

3.3 INSTALLATION OF ELECTRICAL CABINETS AND ENCLOSURES

A. Comply with manufacturer's published instructions.

B. Reference Standards for Installation: Unless more stringent installation requirements are specified in Contract Documents or manufacturers' published instructions, comply with the following:

1. Cabinets and Cutout Boxes: Article 312 of NFPA 70.
2. Consult Architect for resolution of conflicting requirements.

C. Special Installation Techniques:

1. Mount cabinets and enclosures at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to top of box unless otherwise indicated.
2. Do not install cabinets, enclosures, or fittings in contact with concrete or earth.
3. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
4. Identification: Provide labels for cabinets, enclosures, racks and associated electrical equipment.

    a. Identify field-installed conductors, interconnecting wiring, and components.
    b. Provide warning signs.
    c. Label each cabinet, enclosure, and rack with engraved metal or laminated-plastic nameplate.

D. Interfaces with Other Work:

1. Coordinate with Section 078413 "Penetration Firestopping" for installation of sealants.
2. Grounding and Bonding:

    a. Cabinets, Enclosures, and Racks for Electrical Systems: Coordinate with Section 260526 "Grounding and Bonding for Electrical Systems" for grounding of RBBs.
    b. Cabinets, Enclosures, and Racks for Communications Systems and Electronic Safety and Security Systems: Coordinate with Section 260526 "Grounding and Bonding for Electrical Systems" for grounding of RBBs.

3.4 PROTECTION

A. Protect coatings and finishes of cabinets, enclosures, and racks from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 262716

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Specification Grade switches, and dimmer switches.
2. Specification-grade single straight-blade receptacles.
3. Specification grade duplex straight-blade receptacles.
4. Receptacles with arc-fault and ground-fault protective devices.
5. Wall Mount Device Plates (aka; Cover Plates)

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Specification-Grade switches, and dimmer switches.
2. Specification-grade single straight-blade receptacles.
3. Specification-grade duplex straight-blade receptacles.
4. Receptacles with arc-fault and ground-fault protective devices.
5. Wall Mount Device Plates

B. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturers' Instructions: Record copy of official installation and testing instructions issued to Installer by manufacturer for the following:

1. Dimmers.
2. Single straight-blade receptacles.
3. Duplex straight-blade receptacles.
4. Duplex straight-blade receptacles with integral switching means.
5. Receptacles with AFCI device.
6. Receptacles with AFCI and GFCI devices.
7. Receptacles with GFCI device.
8. Wall Mount Device Plates

B. Sample warranties.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Stock Items: Furnish extra materials to Owner that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Extra Keys for Key Lock Switches: One of each kind.
2. SPD Receptacles: Equal to five percent of quantity installed for each kind specified, but no fewer than one unit.
3. Wall Mount Device Plates: Equal to three percent of quantity installed for each kind specified, but no fewer than one unit.

1.6 WARRANTY FOR DEVICES

A. Special Manufacturer Extended Warranty: Manufacturer warrants that devices perform in accordance with specified requirements and agrees to provide repair or replacement of devices that fail to perform as specified within extended warranty period.

1. Initial Extended Warranty Period: Three years from date of Substantial Completion; full coverage for labor, materials, and equipment.
2. Follow-On Extended Warranty Period: Eight years from date of Substantial Completion; prorated coverage for materials that failed because of transient voltage surges only, free on board, destination, freight prepaid.

PART 2 - PRODUCTS

2.1 GENERAL-USE SWITCHES, AND DIMMER SWITCHES

A. Toggle Switch:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

b. General Characteristics:

c. Reference Standards: UL CCN WMUZ and UL 20.

2. Options:

a. Device Color: Gray.
b. Configuration:
1) General-duty, 120-277 V, 20 A, single pole, double pole, three-way, four way.

B. Toggle Switch with Forked Key Lock:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. General Characteristics:

a. Reference Standards: UL CCN WMUZ and UL 20.

3. Options:

a. Device Color: Gray.
b. Configuration:
1) 120-277 V, 20 A, single pole, double pole, three-way, four way.

C. Dimmer Switch:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. General Characteristics:

a. Reference Standards: UL CCN EOYX and UL 1472 Type I dimmer.

3. Options:

a. Device Color: Gray.
b. Switch Style: Toggle.
c. Dimming Control Style: Slide.

2.2 SPECIFICATION-GRADE SINGLE STRAIGHT-BLADE RECEPTACLES

A. Single Straight-Blade Receptacle:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. General Characteristics:

a. Reference Standards: UL CCN RTRT and UL 498.

3. Options:

a. Device Color: Gray.
b. Configuration:

1) General-duty, NEMA 5-20R.

2) General-duty, smooth face, NEMA 5-20R.
3) General-duty, NEMA 6-20R, NEMA 6-30R, NEMA 6-50R.
4) General-duty, NEMA 14-50R (Range).

B. Tamper-Resistant, Simple Straight-Blade Receptacle:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. General Characteristics:

a. Reference Standards: UL CCN RTRT and UL 498.

3. Options:

a. Finish: Stainless steel.
b. Configuration: Recessed, smooth wall plate; NEMA 5-20R.

2.3 SPECIFICATION-GRADE DUPLEX STRAIGHT-BLADE RECEPTACLES

A. Duplex Straight-Blade Receptacle:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. General Characteristics:

a. Reference Standards: UL CCN RTRT and UL 498.

3. Options:

a. Device Color: Gray.
b. Configuration:

1) General-duty, NEMA 5-20R.
2) General-duty, smooth face, NEMA 5-20R.
3) General-duty, NEMA 6-20R.

B. Duplex Straight-Blade Receptacle with USB Outlet to Power Class 2 Equipment (USB):

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. General Characteristics:

a. Reference Standards: UL CCN RTRT and UL 498.

3. Options:

a. Device Color: Gray.
b. Configuration:

1) General-duty, NEMA 5-20R; one USB-A port; one USB-C port.

2.4 RECEPTACLES WITH ARC-FAULT AND GROUND-FAULT PROTECTIVE DEVICES

A. Specification-Grade, Tamper-Resistant Duplex Straight-Blade Receptacle with AFCI Device:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. General Characteristics:

a. Reference Standards: UL CCN AWBZ, UL 498, UL 1699, and UL Subject 1699A.

3. Options:

a. Device Color: Gray.
b. Configuration: Heavy-duty, NEMA 5-20R.

B. Specification -Grade, Tamper-Resistant Duplex Straight-Blade Receptacle with AFCI and GFCI Device:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. General Characteristics:

a. Reference Standards: UL CCN KCXX, UL 498, UL 943, UL 1699, and UL Subject 1699A.

3. Options:

a. Device Color: Gray.
b. Configuration: Heavy-duty, NEMA 5-20R.

C. Specification-Grade, Weather-Resistant, Tamper-Resistant Duplex Straight-Blade Receptacle with GFCI Device:

1. Regulatory Requirements:

a. Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2. General Characteristics:

a. Reference Standards: UL CCN KCXS, UL 498, and UL 943.

3. Options:

a. Device Color: Gray.
b. Configuration: Heavy-duty, NEMA 5-20R.

2.5 WALL MOUNT DEVICE PLATES

A. Stainless Steel Wall Plates: Type 302 stainless steel with satin finish with matching screw head.; Bryant's 93 Series, Crouse-Hinds/AH's 93 Series, Hubbell's 93, Series, Leviton's 910-40 Series, or Pass & Seymour's 93 Series.

B. Weatherproof Covers: Crouse-Hinds WLRS, WLRD with matching screw head., Hubbell's 52, 74 Series, or Pass & Seymour's 45 Series.

C. Weatherproof While In Use Covers:
1. Thermoplastic (Nylon): Cooper Crouse-Hinds TP7488W or Pass & Seymour's (Legrand) WIUC10C.
2. Metallic: Hubbell's WP826 or WP826H, Thomas and Betts' (Red Dot) CKMUV or CKMU, or Leviton's M5979-0GY or M5999-0GY

D. Covers for Threaded Type Boxes: Stamped sheet steel, gasketed device covers with matching screw head.as produced by Crouse-Hinds Co., or OZ/Gedney Co.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Receptacles:

1. Verify that receptacles to be procured and installed for Owner-furnished equipment are compatible with mating attachment plugs on equipment.

3.2 INSTALLATION OF SWITCHES

A. Comply with manufacturer's instructions.

B. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
3. Consult Architect for resolution of conflicting requirements.

C. Identification:

1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 260553 "Identification for Electrical Systems."

a. Mark cover or cover plate using hot, stamped, or engraved machine printing with black-filled lettering, and provide durable wire markers or tags inside device box or outlet box.

3.3 INSTALLATION OF STRAIGHT-BLADE RECEPTACLES

A. Comply with manufacturer's instructions.

B. Reference Standards:

1. Unless more stringent requirements are specified in Contract Documents or manufacturers' instructions, comply with installation instructions in NECA NEIS 130.
2. Mounting Heights: Unless otherwise indicated in Contract Documents, comply with mounting heights recommended in NECA NEIS 1.
3. Receptacle Orientation: Unless otherwise indicated in Contract Documents, orient receptacle to match configuration diagram in NEMA WD 6.
4. Consult Architect for resolution of conflicting requirements.

C. Identification:

1. Identify cover or cover plate for device with panelboard identification and circuit number in accordance with Section 260553 "Identification for Electrical Systems."

a. Mark cover or cover plate using hot, stamped, or engraved machine printing with black-filled lettering, and provide durable wire markers or tags inside device box or outlet box.
b. Healthcare Facilities: Distinctively identify covers or cover plates of device boxes and outlet boxes that are supplied from life safety and critical branch power supplies following facility's standard practice.

D. Interfaces with Other Work:

1. Do not install Type 3 SPD, including surge-protected relocatable taps and power strips, on branch circuit downstream of GFCI device.

3.4 FIELD QUALITY CONTROL OF SWITCHES

A. Acceptance Testing Preparation:

B. Field tests and inspections must be witnessed by Campus Representative.

C. Tests and Inspections:

1. Perform tests and inspections in accordance with manufacturers' instructions.

D. Nonconforming Work:

1. Unit will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

E. Assemble and submit test and inspection reports.

F. Manufacturer Services:

1. Engage factory-authorized service representative to conduct field tests and inspections.

3.5 FIELD QUALITY CONTROL OF STRAIGHT-BLADE RECEPTACLES

A. Acceptance Testing Preparation:

B. Field tests and inspections must be witnessed by Architect.

C. Tests and Inspections:

1. Insert and remove test plug to verify that device is securely mounted.
2. Verify polarity of hot and neutral pins.
3. Measure line voltage.
4. Measure percent voltage drop.
5. Measure grounding circuit continuity; impedance must be not greater than 2 ohms.
6. Healthcare Facilities: Test straight-blade receptacles in patient care spaces with receptacle pin tension test instrument in accordance with NFPA 99. Retention force of ground pin must be not less than 115 g (4 oz).
7. Perform additional installation and maintenance inspections and diagnostic tests in accordance with NECA NEIS 130 and manufacturers' instructions.

D. Nonconforming Work:

1. Device will be considered defective if it does not pass tests and inspections.
2. Remove and replace defective units and retest.

E. Assemble and submit test and inspection reports.

F. Manufacturer Services:

1. Engage factory-authorized service representative to conduct field tests and inspections.

3.6 SYSTEM STARTUP FOR SWITCHES

A. Engage a factory-authorized service representative to perform startup service.

1. Complete installation and startup checks for momentary switches, and dimmer switches in accordance with manufacturer's instructions.

3.7 PROTECTION

A. Devices:

1. Schedule and sequence installation to minimize risk of contamination of wires and cables, devices, device boxes, outlet boxes, covers, and cover plates by plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other materials.

2. After installation, protect wires and cables, devices, device boxes, outlet boxes, covers, and cover plates from construction activities. Remove and replace items that are contaminated, defaced, damaged, or otherwise caused to be unfit for use prior to acceptance by Owner.

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cartridge fuses rated 600 V ac and less for use in the following:

   a. Control circuits.
   b. Panelboards.
   c. Switchboards.
   d. Enclosed controllers.
   e. Enclosed switches.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, current-limiting, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

1. Type RK-1: 250V, zero- to 600-A rating, 200 kAIC, time delay.
2. Type RK-5: 600-V, zero- to 600-A rating, 200 kAIC, time delay
3. Type CC: 600-V, zero- to 30-A rating, 200 kAIC, time delay.
4. Type CD: 600-V, 31- to 60-A rating, 200 kAIC, time delay.
5. Type J: 600-V, zero- to 600-A rating, 200 kAIC, time delay.
6. Type L: 600-V, 601- to 6000-A rating, 200 kAIC, time delay.
7. Type T: 250-V, zero- to 1200-A 600-V, zero- to 800-A rating, 200 kAIC, very fast acting , time delay.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with NEMA FU 1 for cartridge fuses.

D. Comply with NFPA 70.

E. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

B. Install spare-fuse cabinet(s) in location shown on the Drawings or as indicated in the field by Owner.

3.2 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information inside of door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Non-fusible switches.
3. Receptacle switches.
4. Shunt trip switches.
5. Molded-case circuit breakers (MCCBs).
6. Enclosures.

1.2 DEFINITIONS

A. GFEP: Ground-fault circuit-interrupter for equipment protection.

B. GFLS: Ground-fault circuit-interrupter for life safety.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include nameplate ratings, dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
2. Enclosure types and details for types other than UL 50E, Type 1.
3. Current and voltage ratings.
4. Short-circuit current ratings (interrupting and withstand, as appropriate).
5. Include evidence of qualified electrical testing laboratory listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
7. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device. Provide in PDF electronic format.

B. Shop Drawings: For enclosed switches and circuit breakers.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include wiring diagrams for power, signal, and control wiring.

C. Field Quality-Control Submittals:

1. Field quality-control reports.

1.4 INFORMATIONAL SUBMITTALS

A. Sample warranties.

1.5 CLOSEOUT SUBMITTALS

A. Warranty documentation.

1.6 WARRANTY

A. Special Installer Extended Warranty: Installer warrants that fabricated and installed enclosed switches and circuit breakers perform in accordance with specified requirements and agrees to repair or replace components or products that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: Two years from date of Substantial Completion; full coverage for labor, materials, and equipment.

B. Special Manufacturer Extended Warranty: Manufacturer warrants that enclosed switches and circuit breakers perform in accordance with specified requirements and agrees to provide repair or replacement of components or products that fail to perform as specified within extended-warranty period.

1. Extended-Warranty Period: Three years from date of Substantial Completion; full coverage for labor, materials, and equipment.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS

A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.

B. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA 70, by qualified electrical testing laboratory recognized by authorities having jurisdiction and marked for intended location and application.

2.2 FUSIBLE SWITCHES

A. As Manufactured by Square-D, or approved equal by:

1. Eaton
2. Siemens

B. Type HD, Heavy Duty:

1. Single throw.
2. Three-pole.
3. 600 V(ac).
4. 1200 A and smaller 200 A and smaller.
5. UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate specified fuses.
6. Lockable handle with capability to accept three padlocks and interlocked with cover in closed position.

C. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Service-Rated Switches: Labeled for use as service equipment.

2.3 NONFUSIBLE SWITCHES

A. Type GD, General Duty, Three Pole, Single Throw, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

B. Type HD, Heavy Duty, Three Pole, Single Throw, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Six Pole, Single Throw, 200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Type HD, Heavy Duty, Three Pole, Double Throw, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

E. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

5. Service-Rated Switches: Labeled for use as service equipment.

2.4 RECEPTACLE SWITCHES

A. Type HD, Heavy-Duty, Three Pole, Single-Throw Fusible Switch: 250V(ac), 600V(ac), 30A, 60A 100A rated; UL 98 and NEMA KS 1; horsepower rated, with clips or bolt pads to accommodate specified fuses; lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

B. Type HD, Heavy-Duty, Three Pole, Single-Throw Non fusible Switch: 50V(ac), 600V(ac), 30A, 60A 100A rated; UL 98 and NEMA KS 1; horsepower rated, lockable handle with capability to accept three padlocks; interlocked with cover in closed position.

C. Interlocking Linkage: Provided between receptacle and switch mechanism to prevent inserting or removing plug while switch is in on position, inserting plug other than specified, and turning switch on if incorrect plug is inserted or correct plug has not been fully inserted into receptacle.

D. Receptacle: Polarized, three-phase, four-wire receptacle (fourth wire connected to enclosure ground lug).

E. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
4. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
5. Service-Rated Switches: Labeled for use as service equipment.

F. Control Circuit: 120 V(ac); obtained from integral control power transformer, with primary and secondary fuses, with control power of enough capacity to operate shunt trip, pilot, indicating and control devices.

G. Accessories:

1. Oiltight key switch for key-to-test function.
2. Oiltight red, green, white, yellow ON pilot light.
3. Isolated neutral lug; 200 percent rating.
4. Mechanically interlocked auxiliary contacts that change state when switch is opened and closed.
5. Three-pole, double-throw, fire-safety and alarm relay; 24 V(dc) coil voltage.
6. Three-pole, double-throw, fire-alarm voltage monitoring relay complying with NFPA 72.
7. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
8. Isolated Ground Kit: Internally mounted; insulated, labeled for copper and aluminum neutral conductors.
9. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

10. Service-Rated Switches: Labeled for use as service equipment.

2.5 MOLDED-CASE CIRCUIT BREAKERS

A. using glass-reinforced insulating material. Current carrying components must be completely isolated from handle and accessory mounting area.

B. Circuit breakers must have toggle operating mechanism with common tripping of all poles, which provides quick-make, quick-break contact action. Circuit-breaker handle must be over center, be trip free, and reside in tripped position between on and off to provide local trip indication. Circuit-breaker escutcheon must be clearly marked on and off in addition to providing international I/O markings. Equip circuit breaker with push-to-trip button, located on face of circuit breaker to mechanically operate circuit-breaker tripping mechanism for maintenance and testing purposes.

C. Maximum ampere rating and UL, IEC, or other certification standards with applicable voltage systems and corresponding interrupting ratings must be clearly marked on face of circuit breaker. Circuit breakers must be 100 percent rated or series rated as indicated on Drawings. Circuit breaker/circuit breaker combinations for series connected interrupting ratings must be listed by UL as recognized component combinations. Series rated combination used must be marked on end-use equipment along with statement "Caution - Series Rated System. _____ Amps Available. Identical Replacement Component Required."

D. MCCBs must be equipped with device for locking in isolated position.

E. Lugs must be suitable for wire 90 deg C rated wire, sized in accordance with 75 deg C temperature rating in NFPA 70.

F. Standard: Comply with UL 489 with required interrupting capacity for available fault currents.

G. Thermal-Magnetic Circuit Breakers: Inverse time-current thermal element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

H. Electronic Trip Circuit Breakers: Field-replaceable rating plug, RMS sensing, with the following field-adjustable settings:

1. Instantaneous trip.
2. Long- and short-time pickup levels.
3. Long- and short-time time adjustments.
4. Ground-fault pickup level, time delay, and I-squared t response.

I. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

J. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.

3. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
4. Alarm Switch: One NO, NC contact that operates only when circuit breaker has tripped.
5. Auxiliary Contacts: One SPDT switch, Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

2.6 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: UL 489, NEMA KS 1, UL 50E, and UL 50, to comply with environmental conditions at installed location.

B. Enclosure Finish: Enclosure must be gray baked enamel paint, electrodeposited on cleaned, phosphatized steel UL 50E Type 1.

C. Conduit Entry: UL 50E Types 4, 4X, and 12 enclosures may not contain knockouts. UL 50E Types 7 and 9 enclosures must be provided with threaded conduit openings in both endwalls.

D. Operating Mechanism: Circuit-breaker operating handle must be externally operable with operating mechanism being integral part of box, not cover Cover interlock mechanism must have externally operated override. Override may not permanently disable interlock mechanism, which must return to locked position once override is released. Tool used to override cover interlock mechanism must not be required to enter enclosure in order to override interlock.

E. Enclosures designated as UL 50E Type 4, 4X stainless steel, 12, or 12K must have dual cover interlock mechanism to prevent unintentional opening of enclosure cover when circuit breaker is ON and to prevent turning circuit breaker ON when enclosure cover is open.

F. UL 50E Type 7/9 enclosures must be furnished with breather and drain kit to allow their use in outdoor and wet location applications.

PART 3 - EXECUTION

3.1 SELECTION OF ENCLOSURES

A. Indoor, Dry and Clean Locations: UL 50E, Type 1

B. Outdoor Locations: UL 50E, Type 3R, Type 4X

C. Wash-Down Areas: UL 50E, Type 4X.

D. Other Wet or Damp, Indoor Locations: UL 50E, Type 4

E. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: UL 50E, Type 12.

F. Hazardous Areas Indicated on Drawings: UL 50E, Type 7, Type 9 with cover attached by Type 316 stainless steel bolts.

G. Set and adjust settings in accordance with Section 260572 "Overcurrent Protective Device Short-Circuit Study" and Section 260573.16 "Coordination Studies.

3.2 INSTALLATION

A. Comply with manufacturer's published instructions.

B. Special Techniques:

1. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
2. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
3. Comply with mounting and anchoring requirements specified in Section 260548.16 "Seismic Controls for Electrical Systems."
4. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
5. Install fuses in fusible devices.
6. Set and adjust settings in accordance with Section 260572 "Overcurrent Protective Device Short-Circuit Study" and Section 260573.16 "Coordination Studies.

3.3 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.4 FIELD QUALITY CONTROL

A. Testing Preparation:

B. Field tests and inspections must be witnessed by Architect**.**

C. Tests and Inspections for Switches:

1. Visual and Mechanical Inspection:

a. Inspect physical and mechanical condition.
b. Inspect anchorage, alignment, grounding, and clearances.
c. Verify that unit is clean.
d. Verify blade alignment, blade penetration, travel stops, and mechanical operation.
e. Verify that fuse sizes and types match the Specifications and Drawings.
f. Verify that each fuse has adequate mechanical support and contact integrity.
g. Inspect bolted electrical connections for high resistance using one of the following methods:

1) Use low-resistance ohmmeter.

a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS Table 100.12.

h. Verify that operation and sequencing of interlocking systems is as described in the Specifications and shown on Drawings.
i. Verify correct phase barrier installation.
j. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
b. Measure contact resistance across each switchblade fuseholder. Drop values may not exceed high level of manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
c. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with switch closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use Table 100.1 from NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
d. Measure fuse resistance. Investigate fuse-resistance values that deviate from each other by more than 15 percent.
e. Perform ground fault test in accordance with NETA ATS Section 7.14 "Ground Fault Protection Systems, Low-Voltage."

D. Tests and Inspections for Molded-Case Circuit Breakers:

1. Visual and Mechanical Inspection:

a. Verify that equipment nameplate data are as described in the Specifications and shown on Drawings.
b. Inspect physical and mechanical condition.
c. Inspect anchorage, alignment, grounding, and clearances.
d. Verify that unit is clean.
e. Operate circuit breaker to ensure smooth operation.
f. Inspect bolted electrical connections for high resistance using one of the following methods:

1) Use low-resistance ohmmeter.

a) Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from those of similar bolted connections by more than 50 percent of lowest value.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or NETA ATS Table 100.12.

a) Bolt-torque levels must be in accordance with manufacturer's published data. In absence of manufacturer's published data, use NETA ATS Table 100.12.

g. Inspect operating mechanism, contacts, and chutes in unsealed units.
h. Perform adjustments for final protective device settings in accordance with coordination study.

2. Electrical Tests:

a. Perform resistance measurements through bolted connections with low-resistance ohmmeter. Compare bolted connection resistance values to values of similar connections. Investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
b. Perform insulation-resistance tests for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed, and across each open pole. Apply voltage in accordance with manufacturer's published data. In absence of manufacturer's published data, use Table 100.1 from NETA ATS. Investigate values of insulation resistance less than those published in Table 100.1 or as recommended in manufacturer's published data.
c. Perform contact/pole resistance test. Drop values may not exceed high level of manufacturer's published data. If manufacturer's published data are not available, investigate values that deviate from adjacent poles or similar switches by more than 50 percent of lowest value.
d. Perform insulation resistance tests on control wiring with respect to ground. Applied potential must be 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable. Test duration must be one minute. For units with solid state components, follow manufacturer's recommendation. Insulation resistance values may be no less than 2 MΩ.
e. Determine the following by primary current injection:

1) Long-time pickup and delay. Pickup values must be as specified. Trip characteristics may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
2) Short-time pickup and delay. Short-time pickup values must be as specified. Trip characteristics may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
3) Ground-fault pickup and time delay. Ground-fault pickup values must be as specified. Trip characteristics may not exceed manufacturer's published time-current characteristic tolerance band, including adjustment factors.
4) Instantaneous pickup. Instantaneous pickup values must be as specified and within manufacturer's published tolerances.

f. Test functionality of trip unit by means of primary current injection. Pickup values and trip characteristics must be as specified and within manufacturer's published tolerances.
g. Perform minimum pickup voltage tests on shunt trip and close coils in accordance with manufacturer's published data. Minimum pickup voltage of shunt trip and close coils must be as indicated by manufacturer.

h. Verify correct operation of auxiliary features such as trip and pickup indicators; zone interlocking; electrical close and trip operation; trip-free, anti-pump function; and trip unit battery condition. Reset trip logs and indicators. Investigate units that do not function as designed.
i. Verify operation of charging mechanism. Investigate units that do not function as designed.

3. Test and adjust controls, remote monitoring, and safeties.

E. Nonconforming Work:

1. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
2. Remove and replace defective units and retest.

F. Collect, assemble, and submit test and inspection reports.

1. Test procedures used.
2. Include identification of each enclosed switch and circuit breaker tested and describe test results.
3. List deficiencies detected, remedial action taken, and observations after remedial action.

G. Manufacturer Services:

1. Engage factory-authorized service representative to conduct field tests and inspections.

3.5 ADJUSTING

A. Adjust moving parts and operable components to function smoothly and lubricate as recommended by manufacturer.

B. Set field-adjustable circuit-breaker trip ranges as specified in Section 260573.16 "Coordination Studies." to values indicated on Drawings.

END OF SECTION 262816

SECTION 263213.16 - GAS-ENGINE-DRIVEN GENERATOR SETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Gas-engine-driven generator sets.
2. Gas engine.
3. Gas fuel system.
4. Control and monitoring.
5. Generator overcurrent and fault protection.
6. Generator, exciter, and voltage regulator.
7. Vibration isolation devices.
8. Load Bank – Radiator Mounted
9. Generator Set Enclosure
10. Docking Station – External Pad Mount

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans and elevations for engine generator and other components specified.
2. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
3. Identify fluid drain ports and clearance requirements for proper fluid drain.
4. Design calculations for selecting vibration isolators and seismic restraints and for designing vibration isolation bases.
5. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment. Include base weights.
6. Include diagrams for power, signal, and control wiring. Complete schematic, wiring, and interconnection diagrams showing terminal markings for EPS equipment and functional relationship between all electrical components.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer

B. Source quality-control reports.

C. Field quality-control reports.

D. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

B. Testing Agency Qualifications: Accredited by NETA.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GAS-ENGINE-DRIVEN GENERATOR SETS

A. Basis of Design Product: Subject to compliance with requirements, provide product by Caterpillar Inc. or a comparable product by one of the following:

1. MTU Onsite Energy.
2. Onan/Cummins Power Generation.
3. Kohler Co., Generator Division

B. Source Limitations: Obtain packaged engine generators and auxiliary components through one source from a single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. B11 Compliance: Comply with B11.19.

B. NFPA Compliance:

1. Comply with NFPA 37.
2. Comply with NFPA 70.

3. Comply with NFPA 110 requirements for Level 1 EPSS.

C. UL Compliance: Comply with UL 2200.

D. Engine Exhaust Emissions: Comply with EPA NSPS requirements for stationary emergency natural gas engine generator set and applicable state and local government requirements.

E. Noise Emission: Provide Level 3 Sound attenuated enclosure with 65dBA for maximum noise level at at 23 feet in the horizontal plane due to sound emitted by engine generator including engine, engine exhaust, engine cooling-air intake and discharge, and other components of installation.

F. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:

1. Ambient Temperature: Minus 15 to 40 deg C.
2. Altitude: Sea level to 500feet.

G. Unusual Service Conditions: Engine generator equipment and installation are required to operate under the following conditions:

2.3 ENGINE GENERATOR ASSEMBLY DESCRIPTION

A. Factory-assembled and -tested, water-cooled engine, with brushless generator and accessories.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a testing agency acceptable to authorities having jurisdiction, and marked for intended location and use.

C. Power Rating: Standby Emergency Generator

D. EPSS Class: Engine generator shall be classified as Class 96 according to NFPA 110.

E. Service Load: 323kVA (275kW).

F. Power Factor: 0.8 lagging.

G. Frequency: 60 Hz

H. Voltage 480 V ac.

I. Phase: Three-phase, four wire, wye

J. Induction Method: Turbocharged.

K. Governor: Adjustable isochronous, with speed sensing.

L. Mounting Frame: Structural steel framework to maintain alignment of mounted components without depending on concrete foundation. Provide lifting attachments sized and spaced to prevent deflection of base during lifting and moving.

1. Rigging Diagram: Inscribed on metal plate permanently attached to mounting frame to indicate location and lifting capacity of each lifting attachment and generator-set center of gravity.

M. Capacities and Characteristics:

1. Power Output Ratings: Nominal ratings as indicated at 0.8 power factor excluding power required for the continued and repeated operation of the unit and auxiliaries**,**
2. Nameplates: For each major system component to identify manufacturer's name and address, and model and serial number of components.

N. Engine Generator Performance:

1. Steady-State Voltage Operational Bandwidth: 3 percent of rated output voltage from no load to full load.
2. Transient Voltage Performance: Not more than 20 percent variation for 50 percent step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5 percent of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5 percent variation for 50 percent step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5 percent total and 3 percent for single harmonics. Telephone influence factor, determined according to NEMA MG 1, shall not exceed 50 percent.
7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to generator system components.
8. Start Time:

a. Comply with NFPA 110, 10 system requirements.

2.4 GAS ENGINE

A. Fuel: Natural gas

B. Rated Engine Speed: 1800 rpm.

C. Lubrication System: Engine mounted.

1. Filter and Strainer: Rated to remove 90 percent of particles 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and is designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps, siphons, special tools, or appliances.

D. Jacket Coolant Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with UL 499 and with NFPA 110 requirements for Level 1 equipment for heater capacity.

E. Cooling System: Closed loop, liquid cooled, with radiator factory mounted on engine generator mounting frame and integral engine-driven coolant pump.

1. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.
2. Size of Radiator: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
3. Expansion Tank: Constructed of welded steel plate and rated to withstand maximum closed-loop coolant system pressure for engine used. Equip with gage glass and petcock.
4. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.
5. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.

   a. Rating: 50-psig maximum working pressure with coolant at 180 deg F, and non-collapsible under vacuum.
   b. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

F. Muffler/Silencer: Critical type, sized as recommended by engine manufacturer and selected with exhaust piping system to not exceed engine manufacturer's engine backpressure requirements.

1. Minimum sound attenuation of 25 dB at 500 Hz.
2. Sound level measured at a distance of 25 feet from exhaust discharge after installation is complete shall be 65 dBA or less.

G. Air-Intake Filter: Standard-duty, engine-mounted air cleaner with replaceable dry-filter element and "blocked filter" indicator.

H. Starting System: 24-VDC electric, with negative ground.

1. Components: Sized so they are not damaged during a full engine-cranking cycle with ambient temperature at maximum specified in "Performance Requirements" Article.
2. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
3. Cranking Cycle: Four 15 second cranks for a total of 60 seconds.

4. Battery: Lead acid, with capacity within ambient temperature range specified in "Performance Requirements" Article to provide specified cranking cycle at least four times without recharging.
5. Battery Cable: Size as recommended by engine manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.
6. Battery Rack: Factory-fabricated, metal with acid-resistant finish designed to hold the quantity of battery cells required and to maintain the arrangement to minimize lengths of battery interconnections.
7. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35 A minimum continuous rating.
8. Battery Charger: Current-limiting, automatic-equalizing and float-charging type designed for lead-acid batteries. Unit shall comply with UL 1236 and include the following features:

    a. Operation: Equalizing-charging rate of 20 A shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjust float and equalize voltages for variations in ambient temperature from minus 40 deg F to 140 deg F to prevent overcharging at high temperatures and undercharging at low temperatures.
    c. Automatic Voltage Regulation: Maintain constant output voltage regardless of input voltage variations up to plus or minus 10 percent.
    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
    e. Safety Functions: Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
    f. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.

2.5 GASEOUS FUEL SYSTEM

A. Natural Gas Piping: Comply with requirements in Section 231123 "Facility Natural Gas Piping."

B. Gas Train: Comply with NFPA 37.

C. Engine Fuel System:

    a. Secondary Gas Regulators: One for each fuel type, with atmospheric vents piped to building exterior.
    b. Fuel-Shutoff Solenoid Valves: NRTL-listed, normally closed, safety shutoff valves; one for each fuel source.

2. Fuel Filters: One for each fuel type.
3. Manual Fuel Shutoff Valves: One for each fuel type.
4. Flexible Fuel Connectors: Minimum one for each fuel connection.

2.6 CONTROL AND MONITORING

A. Automatic Starting System Sequence of Operation: When mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic transfer switches initiate starting and stopping of engine generator. When mode-selector switch is switched to the on position, engine generator starts. The off position of same switch initiates generator-set shutdown. When engine generator is running, specified system or equipment failures or derangements automatically shut down engine generator and initiate alarms.

B. Comply with UL 508A.

C. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages shall be grouped in a common control and monitoring panel mounted on the engine generator. Mounting method shall isolate the control panel from generator-set vibration. Panel shall be powered from the engine generator battery.

D. Control and Monitoring Panel:

1. Digital controller with integrated LCD, controls, and microprocessor, capable of local and remote control, monitoring, and programming, with battery backup.
2. Instruments: Located on the control and monitoring panel and viewable during operation.
   a. Engine lubricating-oil pressure gage.
   b. Engine-coolant temperature gage.
   c. DC voltmeter (alternator battery charging).
   d. Running-time meter.
   e. AC voltmeter, for each phase, connected to a phase selector switch.
   f. AC ammeter, for each phase, connected to a phase selector switch.
   g. AC frequency meter.
3. Controls and Protective Devices: Controls, shutdown devices, and common visual alarm indication, including the following:
   a. Cranking control equipment.
   b. Run-Off-Auto switch.
   c. Control switch not in automatic position alarm.
   d. Over-crank alarm.
   e. Over-crank shutdown device.
   f. Low water temperature alarm.
   g. High engine temperature pre-alarm.
   h. High engine temperature.
   i. High engine temperature shutdown device.
   j. Overspeed alarm.
   k. Overspeed shutdown device.
   l. Low fuel pressure.
   m. Coolant low-level alarm.
   n. Coolant low-level shutdown device.
   o. Coolant high-temperature pre-alarm.

p. Coolant high-temperature alarm.
q. Coolant low-temperature alarm.
r. Coolant high-temperature shutdown device.
s. EPS supplying load indicator.
t. Battery high-voltage alarm.
u. Low cranking voltage alarm.
v. Battery-charger malfunction alarm.
w. Battery low-voltage alarm.
x. Lamp test.
y. Contacts for local and remote common alarm.
z. Remote manual stop shutdown device.
aa. Hours of operation.
bb. Engine generator metering, including voltage, current, Hz, kW, kVA, and power factor.
cc. Generator overcurrent protective device not closed alarm.

E. Engine Generator Metering:

F. NFPA 110 Level 1 Remote Annunciator Panel with Common Audible Alarm: Include necessary contacts and terminals in control and monitoring panel. Remote panel shall be powered from the engine generator battery.

G. Remote Alarm Annunciator: An LED indicator light labeled with proper alarm conditions shall identify each alarm event, and a common audible signal shall sound for each alarm condition. Silencing switch in face of panel shall silence signal without altering visual indication. Connect so that after an alarm is silenced, clearing of initiating condition will reactivate alarm until silencing switch is reset. Cabinet and faceplate are surface- or flush-mounting type to suit mounting conditions indicated.

1. Over-crank alarm.
2. Coolant low-temperature alarm.
3. High engine temperature pre-alarm.
4. High engine temperature alarm.
5. Low lube oil pressure alarm.
6. Overspeed alarm.
7. Low fuel pressure alarm.
8. Low coolant level alarm.
9. Low cranking voltage alarm.
10. Audible-alarm silencing switch.
11. Run-Off-Auto switch.
12. Control switch not in automatic position alarm.
13. Lamp test.
14. Low cranking voltage alarm.

H. Remote Emergency-Stop Switch: Weather resistant, wall mounted, unless otherwise indicated; and labeled. Push button shall be protected from accidental operation.

I. Supporting Items: Include sensors, transducers, terminals, relays, and other devices and include wiring required to support specified items. Locate sensors and other supporting items on engine or generator, unless otherwise indicated.

2.7 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Overcurrent protective devices shall be coordinated to optimize selective tripping when a short circuit occurs.

1. Overcurrent protective devices for the entire EPSS shall be coordinated to optimize selective tripping when a short circuit occurs. Coordination of protective devices shall consider both utility and EPSS as the voltage source.
2. Overcurrent protective devices for the EPSS shall be accessible only to authorized personnel.

B. Generator Circuit Breakers: Molded-case, electronic-trip type; 100 percent rated; complying with UL 489.

1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
2. Trip Settings: Selected to coordinate with generator thermal damage curve.
3. Shunt Trip: Connected to trip breaker when engine generator is shut down by other protective devices.
4. Mounting: Adjacent to or integrated with control and monitoring panel.
5. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110 percent of full-rated load for 60 seconds. Indication for this alarm is integrated with other generator-set malfunction alarms. Contacts shall be available for load shed functions.
6. Under single or three-phase fault conditions, regulates generator to 300 percent of rated full-load current for up to 10 seconds.
7. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the engine generator.
8. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

C. Ground-Fault Indication: Comply with NFPA 70, "Emergency System" signals for ground fault.

1. Indicate ground fault with other engine generator alarm indications.

2.8 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. Comply with NEMA MG 1.

B. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall be rotated integrally with generator rotor.

C. Electrical Insulation: Class H.

D. Stator-Winding Leads: Brought out to terminal box to permit future reconnection for other voltages if required. Provide six lead alternator.

E. Range: Provide limited range of output voltage by adjusting the excitation level.

F. Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

G. Enclosure: Drip proof.

H. Instrument Transformers: Mounted within generator enclosure.

I. Voltage Regulator: Solid-state type, separate from exciter, providing performance as specified and as required by NFPA 110.

1. Adjusting Rheostat on Control and Monitoring Panel: Provide plus or minus 5 percent adjustment of output-voltage operating band.
2. Maintain voltage within 30 percent on one step, full load.
3. Provide anti-hunt provision to stabilize voltage.
4. Maintain frequency within 15 percent and stabilize at rated frequency within 5 seconds.

J. Strip Heater: Thermostatically controlled unit arranged to maintain stator windings above dew point.

K. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

L. Sub-transient Reactance: 12 percent, maximum.

2.9 VIBRATION ISOLATION DEVICES

A. Restrained Spring Isolators: Freestanding, steel, open-spring isolators with seismic restraint.

1. Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 1/4-inch-thick, elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and leveling bolt that acts as blocking during installation.
2. Outside Spring Diameter: Not less than 80 percent of compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Minimum Deflection: 1 inch.

B. Comply with requirements in Section 232116 "Hydronic Piping Specialties" for vibration isolation and flexible connector materials for steel piping.

C. Comply with requirements in Section 233113 "Metal Ducts" for vibration isolation and flexible connector materials for exhaust shroud and ductwork.

D. Vibration isolation devices shall not be used to accommodate misalignments or to make bends.

2.10 SOURCE QUALITY CONTROL

A. Prototype Testing: Factory test engine generator using same engine model, constructed of identical or equivalent components, and equipped with identical or equivalent accessories.

1. Tests: Comply with IEEE 115 and with NFPA 110, Level 1 Energy Converters.

2.11 LOADBANK - RADIATOR MOUNTED

A. Provide generator manufacturer's recommended load bank sized for 50% of the nameplate load. Unit shall utilize current transformers to measure generator load. Unit shall be capable of manually and automatically selecting resistive load elements in a minimum of 3 steps. Controls and appurtenances necessary for automatically selecting resistive load elements based on generator loading shall be provided. The initial load bank settings shall be such that the generator operates at 75% of rated load or the load bank is fully utilized. The load bank shall not cause the generator to operate at greater than 100% of rated load.

B. Load Bank shall be radiator duct mounted and cooled by engine while running.

C. Load Bank Controller:

1. Load bank shall include factory remotely installed control. Control shall allow for programming of load bank and for manual selection of load elements.

2.12 GENERATOR SET ENCLOSURE

A. Enclosure Type: Level 3 Sound attenuating, weather protective. Walk in Style.

1. Sound attenuated to 65 dBA at 23 feet as measured from a horizontal distance from the en closure.

B. Enclosure Material: Aluminum or Galvannealed Steel.

C. Hardware Material: Stainless steel.

D. Color: Selected by Architect from manufactures color chart.

E. Access Doors: Lockable hinged doors, with all locks keyed alike.

F. Openings: Designed to prevent bird/rodent entry.

1. Provide motorized intake louvers, Power fail open, Power closed.

G. External Drains: Extend oil and coolant drain lines to exterior of enclosure for maintenance.

H. Sound Attenuating Enclosures: Line enclosure with non-hydroscopic, self-extinguishing sound-attenuating thermal insulating material.

I. Exhaust Silencers: Where exhaust silencers are mounted within enclosure in main engine compartment, insulate silencer to minimize heat dissipation as necessary for operation at rat ed load under worst case ambient temperature,

J. Comply with ASCE 7 for wind loads.

K. Electrical Components

1. Provide 100 amp 3 phase, 4 wire, 120/208 volt load center with main and branch breakers to feed all ancillary items in the enclosure including engine and accessories such as engine jacket water heater, alternator strip heater, battery charger, space heaters, enclo sure lights etc.
2. Provide 5 kw space heater with thermostat, heater shall be electrically disconnected when engine is running.
3. Provide LED AC lighting with 3-way electrical switches (locate near entry doors at each side of enclosure).
4. Provide duplex GFCI AC receptacles.
5. Provide DC power interior lights with 0–30-minute spring wound timer.
6. Provide Emergency Lighting LED Type, with sealed maintenance free nicad battery with 90- minute capacity

2.13 GENERATOR SET DOCKING STATION

A. DOCKING STATION

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    a. TRYSTAR #GDS-2.
    b. Larson Electronics, Inc
    c. Fox Fab Power Solutions.
2. Enclosure
    a. NEMA 4X Rain-Tight Stainless-Steel Enclosure
        1. Pad-lockable front door shall include a hinged access plate at the bottom for entry of temporary cabling that prevents unauthorized tampering while in use.
        2. NEMA 4XIntegrity shall be maintained while temporary cabling is connected during use
        3. Front and Side shall be accessible for maintenance
        4. Top, Side, and Bottom shall be accessible for permanent cabling
3. Powder coat
    a. Paint after fabrication shall be Hammer tone Gray
4. Phase, Neutral, and Ground Busbar

a. Material: Silver-plated Copper
b. Equipment Ground Bus: bonded to box.
c. Isolated Ground Bus: insulated from box.
d. Ground Bus: 50% of phase size.
e. Neutral Bus: Neutral bus rated 100 percent of phase bus.

5. Temporary generator connectors shall be Camlok style mounted on gland plate.
   a. Camlok shall be 16 Series model and color coded according to system voltage requirements.
   b. Camlok connections shall be Bus Bar Style, Cabling or Double Set Screw is not acceptable
   c. Camlok connection shall be protected against accidental contact while not in use
6. Permanent Connection shall be factory installed broad range set-screw mechanical type, located behind a physical barrier
7. Short Circuit & Withstand Rating
   a. Shall be minimum 65 KAIC unless otherwise indicated on drawings.
8. Voltage & Amperage
   a. 1200 Amps, 277/480 volts 3 Phase
9. Factory Installed Phase Rotation Monitor Device:
   a. Phase monitoring relay to be Siemens 3U4512-1AR20 or equal and factory installed.
10. Kirk Key Interlocks, Access door is kirk keyed with permanent generator set main line circuit breaker.

B. Additional accessories shall be included as follows:
   1. Option #A: Two Wire Auto Start
   2. Option #C: Battery Charger Receptacle 20A GFCI 125V
   3. Option #D: Block Heater Receptacle 30A L5-30 125V
   4. Kirk Key Door Interlock

PART 3 - EXECUTION

3.1 INSTALLATION

A. Interruption of Existing Electrical Service: Do not interrupt electrical service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electrical service according to requirements indicated:

1. Notify Construction Manager and Owner no fewer than two working days in advance of proposed interruption of electrical service.
2. Do not proceed with interruption of electrical service without Campus's written permission.

B. Comply with NECA 1 and NECA 404.

C. Comply with packaged engine generator manufacturers' written installation and alignment instructions and with NFPA 110.

D. Equipment Mounting:

1. Install packaged engine generators on cast-in-place concrete equipment bases. Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Coordinate size and location of concrete bases for packaged engine generators. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
3. Install packaged engine generator with restrained spring isolators having a minimum deflection of 1 inch on generator set enclosure base frame. Secure engine generator enclosure package to anchor bolts installed in concrete bases. Concrete base construction is specified in Section 260548.16 "Seismic Controls for Electrical Systems."

E. Install packaged engine generator to provide access, without removing connections or accessories, for periodic maintenance.

F. Exhaust System: Install Schedule 40, black steel piping with welded joints and connect to engine muffler. Install thimble at wall. Piping shall be same diameter as muffler outlet.

1. Install flexible connectors and steel piping materials according to requirements in Section 232116 "Hydronic Piping Specialties."
2. Insulate muffler/silencer and exhaust system components according to requirements in Section 230719 "HVAC Piping Insulation."
3. Install isolating thimbles where exhaust piping penetrates combustible surfaces with a Coordinate first paragraph below with Drawings.

G. Drain Piping: Install condensate drain piping to muffler drain outlet with a shutoff valve, stainless-steel flexible connector, and Schedule 40, black steel pipe, the full size of the drain connection, with welded joints.

H. Gaseous Fuel Piping:

1. Natural gas piping, valves, and specialties for gas distribution are specified in Section 231123 "Facility Natural Gas Piping."

I. Electrical Wiring: Install electrical devices furnished by equipment manufacturers but not specified to be factory mounted.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Sections. Drawings indicate general arrangement of piping and specialties.

B. Connect fuel, cooling-system, and exhaust-system piping adjacent to packaged engine generator to allow service and maintenance.

C. Connect cooling-system water piping to engine generator and heat exchanger with flexible connectors.

D. Connect engine exhaust pipe to engine with flexible connector.

E. Gaseous Fuel Connections:

1. Connect fuel piping to engines with a gate valve and union and flexible connector.
2. Install manual shutoff valve in a remote location to isolate gaseous fuel supply to the generator.
3. Vent gas pressure regulators outside building a minimum of 60 inches from building openings.

F. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

G. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Provide a minimum of one 90-degree bend in flexible conduit routed to the engine generator from a stationary element.

H. Balance single-phase loads to obtain a maximum of 10 percent unbalance between any two phases.

3.3 IDENTIFICATION

A. Identify system components according to Section 230553 "Identification for HVAC Piping and Equipment" and Section 260553 "Identification for Electrical Systems."

3.4 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections. Allow for a minimum of three site visits by factory-authorized service representative.

B. Tests and Inspections:

1. Perform tests recommended by manufacturer and each visual and mechanical inspection and electrical and mechanical test listed in the first two subparagraphs below as specified in the NETA ATS. Certify compliance with test parameters.

   a. Visual and Mechanical Inspection

      1) Compare equipment nameplate data with drawings and specifications.
      2) Inspect physical and mechanical condition.
      3) Inspect anchorage, alignment, and grounding.
      4) Verify the unit is clean.

   b. Electrical and Mechanical Tests

      1) Perform insulation-resistance tests in accordance with IEEE 43.

         a) Machines larger than 200 hp. Test duration shall be 10 minutes. Calculate polarization index.

      2) Test protective relay devices.
      3) Verify phase rotation, phasing, and synchronized operation as required by the application.
      4) Functionally test engine shutdown for low oil pressure, overtemperature, overspeed, and other protection features as applicable.
      5) Verify correct functioning of the governor and regulator.

2. NFPA 110 Acceptance Tests: Perform tests required by NFPA 110 that are additional to those specified here, including, but not limited to, single-step full-load pickup test.
3. Battery Tests: Equalize charging of battery cells according to manufacturer's written instructions. Record individual cell voltages.

   a. Measure charging voltage and voltages between available battery terminals for full-charging and float-charging conditions. Check electrolyte level and specific gravity under both conditions.
   b. Test for contact integrity of all connectors. Perform an integrity load test and a capacity load test for the battery.
   c. Verify acceptance of charge for each element of the battery after discharge.
   d. Verify that measurements are within manufacturer's specifications.

4. Battery-Charger Tests: Verify specified rates of charge for both equalizing and float-charging conditions.
5. System Integrity Tests: Methodically verify proper installation, connection, and integrity of each element of engine generator system before and during system operation. Check for air, exhaust, and fluid leaks.

6. Voltage and Frequency Transient Stability Tests: Use recording oscilloscope to measure voltage and frequency transients for 50 and 100 percent step-load increases and decreases, and verify that performance is as specified.
7. Harmonic-Content Tests: Measure harmonic content of output voltage at 25 percent and 100 percent of rated linear load. Verify that harmonic content is within specified limits.
8. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at four locations 23 feet from edge of the generator enclosure, and compare measured levels with required values.

C. Coordinate tests with tests for transfer switches and run them concurrently.

D. Test instruments shall have been calibrated within the past 12 months, traceable to NIST Calibration Services, and adequate for making positive observation of test results. Make calibration records available for examination on request.

E. Leak Test: After installation, charge exhaust, coolant, and fuel systems and test for leaks. Repair leaks and retest until no leaks exist.

F. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation for generator and associated equipment.

G. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

H. Remove and replace malfunctioning units and retest as specified above.

I. Retest: Correct deficiencies identified by tests and observations and retest until specified requirements are met.

J. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation resistances, time delays, and other values and observations. Attach a label or tag to each tested component indicating satisfactory completion of tests.

3.5 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain packaged engine generators.

END OF SECTION 263213.16

SECTION 263600 - TRANSFER SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes automatic transfer switches rated 600 V and less.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Include plans, elevations, sections, details showing minimum clearances, conductor entry provisions, gutter space, and installed features and devices.
2. Single-Line Diagram: Show connections between transfer switch, power sources, and load.

1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Data: Certificates, for transfer switches, accessories, and components, from manufacturer.

B. Source quality control reports.

C. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace components of transfer switch or transfer switch components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA ICS 1.

C. Comply with NFPA 110.

D. Indicated Current Ratings: Apply as defined in UL 1008 for continuous loading and total system transfer, including tungsten filament lamp loads not exceeding 30 percent of switch ampere rating, unless otherwise indicated.

E. Tested Fault-Current Closing and Short-Circuit Ratings: Adequate for duty imposed by protective devices at installation locations in Project under the fault conditions indicated, based on testing according to UL 1008.

1. Where transfer switch includes internal fault-current protection, rating of switch and trip unit combination shall exceed indicated fault-current value at installation location.
2. Short-time withstand capability for three cycles.

F. Repetitive Accuracy of Solid-State Controls: All settings shall be plus or minus 2 percent or better over an operating temperature range of minus 20 to plus 70 deg C.

G. Resistance to Damage by Voltage Transients: Components shall meet or exceed voltage-surge withstand capability requirements when tested according to IEEE C62.62. Components shall meet or exceed voltage-impulse withstand test of NEMA ICS 1.

H. Electrical Operation: Accomplish by a non-fused, momentarily energized solenoid or electric-motor-operated mechanism. Switches for emergency or standby purposes shall be mechanically and electrically interlocked in both directions to prevent simultaneous connection to both power sources unless closed transition.

2.2 CONTACTOR-TYPE AUTOMATIC TRANSFER SWITCHES

A. <u>Provide as same manufacturer as generator set or equal by ASCO or Russelectric.</u>

B. Comply with Level 1 equipment according to NFPA 110.

C. Switch Characteristics: Designed for continuous-duty repetitive transfer of full-rated current between active power sources.

D. Provide as per shown on drawings.

E. Provide 4 Pole Automatic Transfer Switches.

1. Limitation: Switches using molded-case switches or circuit breakers or insulated-case circuit-breaker components are unacceptable.
2. Switch Action: Double throw; mechanically held in both directions.
3. Contacts: Silver composition or silver alloy for load-current switching. Contactor-style automatic transfer-switch units, rated 600 A and higher, shall have separate arcing contacts.
4. Conductor Connectors: Suitable for use with conductor material and sizes.
5. Material: Hard-drawn copper, 98 percent conductivity.
6. Main and Neutral Lugs: Mechanical type.
7. Ground Lugs and Bus-Configured Terminators: Mechanical type.
8. Ground bar.
9. Connectors shall be marked for conductor size and type according to UL 1008.

F. Automatic Open-Transition Transfer Switches: Interlocked to prevent the load from being closed on both sources at the same time.

1. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.

G. Automatic Delayed-Transition Transfer Switches: Pauses or stops in intermediate position to momentarily disconnect both sources, with transition controlled by programming in the automatic transfer-switch controller. Interlocked to prevent the load from being closed on both sources at the same time.

1. Adjustable Time Delay: For override of normal-source voltage sensing to delay transfer and engine start signals for alternative source. Adjustable from zero to six seconds, and factory set for one second.
2. Sources shall be mechanically and electrically interlocked to prevent closing both sources on the load at the same time.
3. Fully automatic break-before-make operation with center off position where indicated on drawings.

H. Signal-Before-Transfer Contacts: A set of normally open/normally closed dry contacts operates in advance of retransfer to normal source. Interval shall be adjustable from 1 to 30 seconds.

I. Automatic Transfer-Switch Controller Features:

1. Controller operates through a period of loss of control power.
2. Undervoltage Sensing for Each Phase of Normal and Alternate Source: Sense low phase-to-ground voltage on each phase. Pickup voltage shall be adjustable from 85 to 100 percent of nominal, and dropout voltage shall be adjustable from 75 to 98 percent of pickup value. Factory set for pickup at 90 percent and dropout at 85 percent.
3. Voltage/Frequency Lockout Relay: Prevent premature transfer to generator. Pickup voltage shall be adjustable from 85 to 100 percent of nominal. Factory set for pickup at 90 percent. Pickup frequency shall be adjustable from 90 to 100 percent of nominal. Factory set for pickup at 95 percent.

4. Time Delay for Retransfer to Normal Source: Adjustable from zero to 30 minutes, and factory set for 10 minutes. Override shall automatically defeat delay on loss of voltage or sustained undervoltage of emergency source, provided normal supply has been restored.
5. Test Switch: Simulate normal-source failure.
6. Switch-Position Pilot Lights: Indicate source to which load is connected.
7. Source-Available Indicating Lights: Supervise sources via transfer-switch normal- and emergency-source sensing circuits.

    a. Normal Power Supervision: Green light with nameplate engraved "Normal Source Available."
    b. Emergency Power Supervision: Red light with nameplate engraved "Emergency Source Available."

8. Unassigned Auxiliary Contacts: Two normally open, single-pole, double-throw contacts for each switch position, rated 10 A at 240-V ac.
9. Transfer Override Switch: Overrides automatic retransfer control so transfer switch will remain connected to emergency power source regardless of condition of normal source. Pilot light indicates override status.
10. Engine Starting Contacts: One isolated and normally closed, and one isolated and normally open; rated 10 A at 32-V dc minimum.
11. Engine Shutdown Contacts: Time delay adjustable from zero to five minutes, and factory set for five minutes. Contacts shall initiate shutdown at remote engine-generator controls after retransfer of load to normal source.
12. Engine-Generator Exerciser: Solid-state, programmable-time switch starts engine generator and transfers load to it from normal source for a preset time, then retransfers and shuts down engine after a preset cool-down period. Initiates exercise cycle at preset intervals adjustable from 7 to 30 days. Running periods shall be adjustable from 10 to 30 minutes. Factory settings shall be for 7-day exercise cycle, 20-minute running period, and 5-minute cool-down period. Exerciser features include the following:

    a. Exerciser Transfer Selector Switch: Permits selection of exercise with and without load transfer.
    b. Push-button programming control with digital display of settings.
    c. Integral battery operation of time switch when normal control power is unavailable.

J. Large-Motor-Load Power Transfer:
1. Where indicated on drawings provide Programmed Neutral Switch Position: Switch operator with programmed neutral position arranged to provide a midpoint between the two working switch positions, with an intentional, time-controlled pause at midpoint during transfer. Adjustable pause from 0.5 to 30 seconds minimum, and factory set for 0.5 second unless otherwise indicated. Time delay occurs for both transfer directions. Disable pause unless both sources are live.

2.3 SOURCE QUALITY CONTROL

A. Factory Tests: Test and inspect components, assembled switches, and associated equipment according to UL 1008. Ensure proper operation. Check transfer time and voltage, frequency, and time-delay settings for compliance with specified requirements. Perform dielectric strength test complying with NEMA ICS 1.

B. Prepare test and inspection reports.

1. For each of the tests required by UL 1008, performed on representative devices, for emergency systems. Include results of test for the following conditions:

a. Overvoltage.
b. Undervoltage.
c. Loss of supply voltage.
d. Reduction of supply voltage.
e. Alternative supply voltage or frequency is at minimum acceptable values.
f. Temperature rise.
g. Dielectric voltage-withstand; before and after short-circuit test.
h. Overload.
i. Contact opening.
j. Endurance.
k. Short circuit.
l. Short-time current capability.
m. Receptacle withstand capability.
n. Insulating base and supports damage.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Floor-Mounting Switch: Anchor to floor by bolting.

1. Install transfer switches on cast-in-place concrete equipment base(s). Comply with requirements for equipment bases and foundations specified in Section 033000 "Cast-in-Place Concrete."
2. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases.
3. Provide workspace and clearances required by NFPA 70.

B. Annunciator and Control Panel Mounting: Flush in wall unless otherwise indicated.

C. Identify components according to Section 260553 "Identification for Electrical Systems."

D. Set field-adjustable intervals and delays, relays, and engine exerciser clock.

E. Comply with NECA 1.

3.2 CONNECTIONS

A. Wiring to Remote Components: Match type and number of cables and conductors to generator sets, motor controls, control, and communication requirements of transfer switches as recommended by manufacturer. Increase raceway sizes at no additional cost to Owner if necessary to accommodate required wiring.

B. Wiring Method: Install cables in raceways except within electrical enclosures. Conceal raceway and cables except in unfinished spaces.

   1. Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii.

D. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

E. Connect twisted pair cable according to Section 271513 "Communications Copper Horizontal Cabling."

F. Route and brace conductors according to manufacturer's written instructions. and Section 260529 "Hangers and Supports for Electrical Systems." Do not obscure manufacturer's markings and labels.

G. Final connections to equipment shall be made with liquid tight, flexible metallic conduit no more than 24 inches in length.

3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

   1. Visual and Mechanical Inspection:

      a. Compare equipment nameplate data with Drawings and Specifications.
      b. Inspect physical and mechanical condition.
      c. Inspect anchorage, alignment, grounding, and required clearances.
      d. Verify that the unit is clean.
      e. Verify appropriate lubrication on moving current-carrying parts and on moving and sliding surfaces.
      f. Verify that manual transfer warnings are attached and visible.
      g. Verify tightness of all control connections.
      h. Inspect bolted electrical connections for high resistance using one of the following methods, or both:

         1) Use of low-resistance ohmmeter.

2) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method according to manufacturer's published data.

i. Perform manual transfer operation.
j. Verify positive mechanical interlocking between normal and alternate sources.
k. Perform visual and mechanical inspection of surge arresters.
l. Inspect control power transformers.

1) Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
2) Verify that primary and secondary fuse or circuit-breaker ratings match Drawings.
3) Verify correct functioning of drawout disconnecting contacts, grounding contacts, and interlocks.

2. Electrical Tests:

a. Perform insulation-resistance tests on all control wiring with respect to ground.
b. Perform a contact/pole-resistance test. Compare measured values with manufacturer's acceptable values.
c. Verify settings and operation of control devices.
d. Calibrate and set all relays and timers.
e. Verify phase rotation, phasing, and synchronized operation.
f. Perform automatic transfer tests.
g. Verify correct operation and timing of the following functions:

1) Normal source voltage-sensing and frequency-sensing relays.
2) Engine start sequence.
3) Time delay on transfer.
4) Alternative source voltage-sensing and frequency-sensing relays.
5) Automatic transfer operation.
6) Interlocks and limit switch function.
7) Time delay and retransfer on normal power restoration.
8) Engine cool-down and shutdown feature.

3. Measure insulation resistance phase-to-phase and phase-to-ground with insulation-resistance tester. Include external annunciation and control circuits. Use test voltages and procedure recommended by manufacturer. Comply with manufacturer's specified minimum resistance.

a. Check for electrical continuity of circuits and for short circuits.
b. Inspect for physical damage, proper installation and connection, and integrity of barriers, covers, and safety features.
c. Verify that manual transfer warnings are properly placed.
d. Perform manual transfer operation.

4. After energizing circuits, perform each electrical test for transfer switches stated in NETA ATS and demonstrate interlocking sequence and operational function for each switch at least three times.

    a. Simulate power failures of normal source to automatic transfer switches and retransfer from emergency source with normal source available.
    b. Simulate loss of phase-to-ground voltage for each phase of normal source.
    c. Verify time-delay settings.
    d. Verify pickup and dropout voltages by data readout or inspection of control settings.
    e. Verify proper sequence and correct timing of automatic engine starting, transfer time delay, retransfer time delay on restoration of normal power, and engine cool-down and shutdown.

5. Ground-Fault Tests: Coordinate with testing of ground-fault protective devices for power delivery from both sources.

    a. Verify grounding connections and locations and ratings of sensors.

B. Coordinate tests with tests of generator and run them concurrently.

C. Report results of tests and inspections in writing. Record adjustable relay settings and measured insulation and contact resistances and time delays. Attach a label or tag to each tested component indicating satisfactory completion of tests.

D. Transfer switches will be considered defective if they do not pass tests and inspections.

E. Remove and replace malfunctioning units and retest as specified above.

F. Prepare test and inspection reports.

G. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each switch. Remove all access panels so joints and connections are accessible to portable scanner.

1. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
2. Record of Infrared Scanning: Prepare a certified report that identifies switches checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
3. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each switch 11 months after date of Substantial Completion.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain transfer switches and related equipment.

B. Training shall include testing ground-fault protective devices and instructions to determine when the ground-fault system shall be retested. Include instructions on where ground-fault sensors are located and how to avoid negating the ground-fault protection scheme during testing and circuit modifications.

C. Coordinate this training with that for generator equipment.

END OF SECTION 263600

SECTION 26 43 13 - SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

1.3 DEFINITIONS

A. I nominal: Nominal discharge current.

B. MCOV: Maximum continuous operating voltage.

C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.

D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.

E. OCPD: Overcurrent protective device.

F. SCCR: Short-circuit current rating.

G. SPD: Surge protective device.

H. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, I nominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.5 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For SPDs to include in maintenance manuals.

1.7 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL SPD REQUIREMENTS

A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Comply with UL 1449.

D. MCOV of the SPD shall be the nominal system voltage.

2.2 SERVICE ENTRANCE SUPPRESSOR

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ABB France.
2. Advanced Protection Technologies Inc. (APT).
3. Eaton Corporation.
4. Emerson Electric Co.
5. GE Zenith Controls.
6. LEA International; Protection Technology Group.
7. Leviton Manufacturing Co., Inc.
8. PowerLogics, Inc.
9. Schneider Electric Industries SAS.
10. Siemens Industry, Inc.
11. Surge Suppression Incorporated

B. SPDs: Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1449, Type 1.

1. SPDs with the following features and accessories:

a. Integral disconnect switch.

b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
c. Indicator light display for protection status.
d. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
e. Surge counter.

C. Comply with UL 1283.

D. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 240kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

E. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V or 208Y/120 V, three-phase, four-wire circuits, based on Cat C, 2 ohm combination wave 20 kV/10 kA @ 90 degree phase angle, shall not exceed the following:

1. Line to Neutral: 1200 V for 480Y/277 V, 600 V for 208Y/120 V.
2. Line to Ground: 1200 V for 480Y/277 V, 600 V for 208Y/120 V.
3. Line to Line: 1800 V for 480Y/277 V, 1000 V for 208Y/120 V.
4. Neutral to Ground: 1200 V for 480Y/277 V, 700 V for 208Y/120 V.

F. SCCR: Equal or exceed 200 kA.

G. I nominal Rating: 20 kA.

2.3 PANEL SUPPRESSORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ABB France.
2. Advanced Protection Technologies Inc. (APT).
3. Eaton Corporation.
4. Emerson Electric Co.
5. GE Zenith Controls.
6. LEA International; Protection Technology Group.
7. Leviton Manufacturing Co., Inc.
8. PowerLogics, Inc.
9. Schneider Electric Industries SAS.
10. Siemens Industry, Inc.
11. Surge Suppression Incorporated

B. SPDs: Comply with UL 1449, Type 2.

1. Include LED indicator lights for power and protection status.
2. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
3. Include Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of protection status. Contacts shall reverse on failure of any

surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.

C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 120 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

D. Comply with UL 1283.

E. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V or 208Y/120 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1100 V for 480Y/277 V, 1000 V for 208Y/120 V.
2. Line to Ground: 1300 V for 480Y/277 V, 1100 V for 208Y/120 V.
3. Neutral to Ground: 1600 V for 480Y/277, V 1200 V for 208Y/120 V.
4. Line to Line: 1400 V for 480Y/277 V, 1200 V for 208Y/120 V

F. SCCR: Equal or exceed 200 kA.

G. I nominal Rating: 10 kA.

2.4 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1.

B. Outdoor Enclosures: NEMA 250, Type 4.

2.5 CONDUCTORS AND CABLES

A. Power Wiring: Same size as SPD leads, complying with Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Wiring:

1. Power Wiring: Comply with wiring methods in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. Compare equipment nameplate data for compliance with Drawings and Specifications.
2. Inspect anchorage, alignment, grounding, and clearances.
3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Complete startup checks according to manufacturer's written instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

3.4 DEMONSTRATION

A. Train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION 26 43 13

SECTION 26 51 00 - INTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior lighting fixtures, lamps, and drivers.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color-rendering index.

C. LER: Luminaire efficacy rating.

D. Lumen: Measured output of lamp and luminaire, or both.

E. Luminaire: Complete lighting fixture, including driver housing if provided.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:

1. Physical description of lighting fixture including dimensions.
2. Emergency lighting units including battery and charger.
3. Energy-efficiency data.
4. Sound Performance Data: For air-handling lighting fixtures. Indicate sound power level and sound transmission class in test reports certified according to standards specified in Section 233713 "Diffusers, Registers, and Grilles."
5. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, drivers, and accessories identical to those indicated for the lighting fixture as applied in this Project.

a. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: For nonstandard or custom lighting fixtures. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Samples: May be requested for each lighting fixture indicated in the Lighting Fixture Schedule. Each Sample shall include the following:

1. Lamps and drivers, installed.
2. Cords and plugs.
3. Pendant support system.
4. Installation instructions.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting fixtures.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extends to within 12 inches of the plane of the luminaires.
4. Ceiling-mounted projectors.
5. Structural members to which suspension systems for lighting fixtures will be attached.
6. Other items in finished ceiling including the following:

a. Air outlets and inlets.
b. Speakers.
c. Sprinklers.
d. Smoke and fire detectors.
e. Occupancy sensors.
f. Access panels.

7. Perimeter moldings.

B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

C. Product Certificates: For each type of driver for bi-level and dimmer-controlled fixtures, from manufacturer.

D. Field quality-control reports.

E. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 QUALITY ASSURANCE

A. All light fixture lamps and drivers submitted shall be on the Consortium for Energy Efficiency (CEE) High Performance List or meet CEE High Performance Specifications where the light fixture lamp or driver application/type is so listed or specified.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with NFPA 70.

E. FM Global Compliance: Lighting fixtures for hazardous locations shall be listed and labeled for indicated class and division of hazard by FM Global.

F. Mockups: Provide interior lighting fixtures for room or module mockups, complete with power and control connections.

1. Obtain Architect's approval of fixtures for mockups before starting installations.
2. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
3. Approved fixtures in mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 COORDINATION

A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.9 WARRANTY

A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace

components of rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Warranty Period for Emergency Lighting Unit Batteries: 5 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining years.
2. Warranty Period for Emergency LED driver and Self-Powered Exit Sign Batteries: Five years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining years.

1.10 EXTRA MATERIALS

A. Fixtures: 10 for every 100 of each type and rating installed. Furnish at least two (2) complete fixtures, ready to install, of each type.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Luminaire Schedule on Drawings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. All light fixture lamps and drivers shall be on the Consortium for Energy Efficiency (CEE) High Performance List or meet CEE High Performance Specifications where the light fixture lamp or driver application/type is so listed or specified.

B. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

C. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.

D. Metal Parts: Free of burrs and sharp corners and edges.

E. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

G. Diffusers and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
b. UV stabilized.

2. Glass: Annealed crystal glass unless otherwise indicated.

H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and drivers. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and driver characteristics:

a. "USE ONLY" and include specific lamp type.
b. CCT and CRI for all luminaires.

2.3 LED LIGHTING

A. Bulb shape complying with ANSI C79.1.

B. Lamps dimmable from 100 percent to 0 percent of maximum light output.

C. Internal driver.

D. Nominal Operating Voltage: 120 to 277 volts.

E. In-line Fusing: On the primary for each luminaire.

F. Internal battery pack for emergency lighting when indicated.

2.4 EMERGENCY LED POWER UNIT

A. Internal Type: Self-contained driver, modular, battery-inverter unit, factory mounted within lighting fixture. Comply with UL 924.

1. Emergency Connection: Operate LED's continuously at a reduced lumen output. Connect unswitched and switched circuit to battery-inverter unit.
2. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.

a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

3. Battery: Sealed, maintenance-free, nickel-cadmium type.
4. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.

B. MANUFACTURERS

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to:

    a. Phillips/Bodine Model B30RCT

C. Internal Type: Self-contained driver, modular, battery-inverter unit, factory mounted within lighting fixture. Comply with UL 924.

1. Emergency Connection: Operate one or two lamp(s) continuously at a total output of 3000 lumens. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture driver.
2. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.

    a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

3. Battery: Sealed, maintenance-free, nickel-cadmium type.
4. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
5. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.

2.5 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:

1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

    a. Battery: Sealed, maintenance-free, nickel-cadmium type.
    b. Charger: Fully automatic, solid-state type with sealed transfer relay.
    c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
    d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
    f. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared

receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.

g. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

2.6 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
6. Wire Guard: Heavy-chrome-plated wire guard protects lamp heads or fixtures.
7. Integral Time-Delay Relay: Holds unit on for fixed interval of 15 minutes when power is restored after an outage.
8. Remote Test: Switch in hand-held remote device aimed in direction of tested unit initiates coded infrared signal. Signal reception by factory-installed infrared receiver in tested unit triggers simulation of loss of its normal power supply, providing visual confirmation of either proper or failed emergency response.

2.7 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.

F. Rod Hangers: 3/16-inch (minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

2.8 LUMINAIRE SCHEDULE

A. Refer to Luminaire Schedule on Drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Location:

1. Evenly proportioned in room except adjusted to conform to ceiling pattern as described below and except where otherwise shown or dimensioned.
2. Edges of fixtures parallel with walls.
3. Adjust locations as directed by Architect.

C. Plaster Frames:

1. Provide for all recessed fixtures in plaster & gypsum board type ceilings.
2. Install in cooperation with General Contractor.

D. Remote Mounting of Drivers: Distance between the driver and fixture shall not exceed that recommended by manufacturer. Verify, with driver fixture manufacturers, maximum distance between driver and luminaire.

E. Mounting:

1. Install all fixtures to hang true to vertical, free from finger marks, flaws, scratches, dents or other imperfections.
2. Take care when hanging fixtures to not deface in any way, ceilings or walls.
3. Install continuous rows of fixtures in straight line; all fixtures at same level. Do not rotate fixtures about longitudinal axis with respect to one another.
4. Mount surface fixtures tight to surface without distorting it.
5. Provide proper mounting equipment and trim for recessed fixtures to adapt them to the ceiling or wall construction and to prevent light leaks around trim.
6. Provide special means for supporting fixtures as hereinafter specified, as shown on Drawings, or as required. Provide supports for each fixture capable of supporting 4 times fixture weight. Similar to rod hangers and clamps manufactured by Caddy Co.
7. Do not support outlet boxes by conduit.
8. Install ceiling support system rods or wires, independent of the ceiling suspension devices, for each fixture. Locate not more than 6 inches from lighting fixture corners.
9. Support all lay-in and light fixtures (1 x 4, or 2 x 2 and larger) at all four corners with fixture support clips, Caddy #515 (or approved equal). For seismic protection, provide a #8 ceiling system support wire on all four corners of each fixture.

10. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
11. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
12. Conduit and threaded rod hangers not permitted in finished spaces.

F. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.
5. Hang all stem mounted fixtures level with self-aligning hangers in canopies.
6. Gymnasium high-bay lighting fixtures shall be mounted so that fixture lens is at same elevation as bottom chord of roof truss, unless noted otherwise on drawings.

G. Mechanical Coordination:

1. Coordinate location of all hangers in rooms without ceilings with duct work, plumbing piping, sprinkler piping, etc.
2. Coordinate location of all hangers in rooms without ceilings with duct work, plumbing piping, sprinkler piping, etc.
3. Make all necessary offsets and extensions so that stems and fixtures avoid beams, pipes, ducts, etc.
4. Do not install in fan, storage, and equipment rooms until after all other mechanical work is in place.
5. Where fixtures are located below heating, ventilating, and air conditioning units, and/or ductwork and piping, provide trapeze hangers around obstruction and suspend fixture from trapeze hanger.

H. Architectural Coordination:

1. Locate all hangers at intersections of joints or at centers of blocks in rooms with acoustical tile or other patterned type of ceiling materials.
2. Space continuous row fixtures to conform with corresponding joint intersections.
3. Coordinate all ceiling layouts with general contractor and ceiling subcontractor and obtain architect's approval before proceeding.
4. Coordinate all ceiling layouts with general contractor and ceiling subcontractor and obtain architect's approval before proceeding.
5. Contractor responsible for electrical work: Verify ceiling construction and report in writing any discrepancies between ceiling type and fixture type before releasing fixtures for manufacture.
6. Coordinate all under cabinet lights with Architect before roughing.
7. Obtain Architect’s written lay-out coordination approval prior to installation of lighting fixtures.

I. Air-Handling Lighting Fixtures: Install with dampers closed and ready for adjustment.

J. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

1. Wire the emergency lighting units to the unswitched lighting circuit supplying the space served by the emergency lighting unit.

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

C. Remove and replace with new, all broken glassware, plastic or fixtures damaged before final acceptance at no additional expense to Owner.

D. No allowance made for breakage or theft before final acceptance.

E. Immediately prior to occupancy, damp clean all diffusers, glassware, fixture trims, reflectors, lamps, and replace burned- out lamps.

END OF SECTION 26 51 00

SECTION 265600 – LED EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior solid-state luminaires that are designed for and exclusively use LED lamp technology.
2. Luminaire supports.
3. Luminaire-mounted photoelectric relays.
4. Poles and accessories.

1.3 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color rendering index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. Lumen: Measured output of lamp and luminaire, or both.

F. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

1.4 ACTION SUBMITTALS

A. Product Data: For each luminaire, and support component, arranged in order of lighting unit designation. Include data on features, accessories, finishes, and the following:

1. Physical description of luminaire, including materials, dimensions, effective projected area, and verification of indicated parameters.

2. Details of attaching luminaires and accessories.

3. Details of installation and construction.

4. Luminaire materials.

5. Photometric data based on laboratory tests of each luminaire type, complete with indicated lamps, drivers, and accessories.

   a. Testing Agency Certified Data: For indicated luminaires, photometric data shall be certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.

   b. Manufacturer Certified Data: Photometric data shall be certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

6. Photoelectric relays.

7. LED Drivers, including energy-efficiency data.

8. Lamps, including life, output, CCT, CRI, lumens, and energy-efficiency data.

9. Means of attaching luminaires to supports, and indication that attachment is suitable for components involved.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

2. Anchor-bolt templates keyed to specific poles and certified by manufacturer.

3. Wiring Diagrams: For power, signal, and control wiring.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

B. Field quality-control reports.

Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

1. Operation and Maintenance Data: For luminaires to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fixtures: One for every 100 of each type and rating installed fully assembled and ready to be installed. Furnish at least two of each fixture type.

1.8 QUALITY ASSURANCE

A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturers' laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products and complying with applicable IES testing standards.

C. Provide luminaires from a single manufacturer for each luminaire type.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Comply with IEEE C2, "National Electrical Safety Code."

F. Comply with NFPA 70.

G. Each luminaire type shall be binned within a three-step MacAdam Ellipse to ensure color consistency among luminaires.

H. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces of luminaires by applying a strippable, temporary protective covering prior to shipping.

1.10 FIELD CONDITIONS

A. Verify existing and proposed utility structures prior to the start of work associated with luminaire installation.

B. Mark locations of exterior luminaires for approval by Architect prior to the start of luminaire installation.

1.11 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.

1. Warranty Period for Luminaires: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Products: A available products that may be incorporated into the Work include, but are not limited to, product(s) indicated on Luminaire Schedule on Drawings.

2.2 LUMINAIRE REQUIREMENTS

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

2.3 MATERIALS

A. Metal Parts: Free of burrs and sharp corners and edges.

B. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit servicing without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during servicing and when secured in operating position. Doors shall be removable for cleaning or replacing lenses.

C. Diffusers and Globes:

1. Acrylic Diffusers: 100 percent virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
2. Glass: Annealed crystal glass unless otherwise indicated.
3. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.

D. Lens and Refractor Gaskets: Use heat- and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

E. Reflecting surfaces shall have minimum reflectance as follows unless otherwise indicated:

1. White Surfaces: 85 percent.
2. Specular Surfaces: 83 percent.
3. Diffusing Specular Surfaces: 75 percent.

F. Housings:

1. Rigidly formed, weather- and light-tight enclosure that will not warp, sag, or deform in use.
2. Provide filter/breather for enclosed luminaires.

G. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp characteristics:

a. "USE ONLY" and include specific lamp type.

b. Lamp diameter, shape, size, wattage and coating.
c. CCT and CRI for all luminaires.

2.4 FINISHES

A. Variations in Finishes: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

B. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

C. Factory-Applied Finish for Aluminum Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
2. Natural Satin Finish: Provide fine, directional, medium satin polish (AA-M32); buff complying with AA-M20 requirements; and seal aluminum surfaces with clear, hard-coat wax.
3. Class I, Clear-Anodic Finish: AA-M32C22A41 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.
4. Class I, Color-Anodic Finish: AA-M32C22A42/A44 (Mechanical Finish: Medium satin; Chemical Finish: Etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker), complying with AAMA 611.

   a. Color: As indicated on Luminaire Schedule.

D. Factory-Applied Finish for Steel Luminaires: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation: Clean surfaces to comply with SSPC-SP 1, to remove dirt, oil, grease, and other contaminants that could impair paint bond. Grind welds and polish surfaces to a smooth, even finish. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1 or SSPC-SP 8.
2. Exterior Surfaces: Manufacturer's standard finish consisting of one or more coats of primer and two finish coats of high-gloss, high-build polyurethane enamel.
   a. Color: As selected by Architect from custom RAL full range.

2.5 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.

1. Relay with locking-type receptacle shall comply with ANSI C136.10.

C. Adjustable window slide for adjusting on-off set points.

PART 3 - EXECUTION

3.1 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.

1. Use fastening methods and materials selected to resist seismic forces defined for the application and approved by manufacturer.

C. Adjust luminaires that require field adjustment or aiming. Include adjustment of photoelectric device to prevent false operation of relay by artificial light sources, favoring a north orientation.

3.2 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

B. Steel Conduits: Comply with Section 260533 "Raceways and Boxes for Electrical Systems." In concrete foundations, wrap conduit with 0.010-inch thick, pipe-wrapping plastic tape applied with a 50 percent overlap.

3.3 GROUNDING

A. Ground support structures according to Section 260526 "Grounding and Bonding for Electrical Systems."
1. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.

3.4 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

A. Inspect each installed luminaire for damage. Replace damaged luminaires and components.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Verify operation of photoelectric controls.

C. Illumination Tests:

1. Measure light intensities at night. Use photometers with calibration referenced to NIST standards. Comply with the following IES testing guide(s):

2. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

D. Luminaire will be considered defective if it does not pass tests and inspections.

E. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain luminaires and photocell relays.

3.7 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.

1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 26 56 00

SECTION 271010 - STRUCTURED TELECOMMUNICATIONS CABLING AND ENCLOSURES

PART 1 - GENERAL REQUIREMENTS

1.1 SECTION INCLUDES

A. Cabling and pathways inside building(s).

B. Distribution frames, cross-connection equipment, enclosures, and outlets.

C. Grounding and bonding the telecommunications distribution system.

D. Wireless Access Point (WAP) - Installation Guidelines

1.2 REFERENCES

A. CEA-31 0 - Cabinets, Racks, Panels, and Associated Equipment: Consumer Electronics Association.

B. NFPA 70 - National Electrical Code.

C. C. TIA-492AAAB - Detail Specification for 50-urn Core Diameter/i 25-urn Cladding Diameter Class la Graded-Index Multimode Optical Fibers.

D. TIA-526-14 - OFSTP-i 4 - Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant.

E. TIA/EIA-568-B.2 - Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted Pair Cabling Components.

F. TIA/EIA-568-B.3 - Commercial Building Telecommunications Cabling Standard - Part 3: Optical Fiber Cabling Components Standard, and Addendum 1 - Additional Transmission Performance Specifications for 50/125 um Optical Fiber Cables.

G. TIA-/EIA-569-D-1- Commercial Building Standard for Telecommunications Pathways and Spaces.

H. TIA/EIA-606 - Administration Standard for the Telecommunications Infrastructure.

I. ANSI/J-STD-607 - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.

J. UL 444 - Communications Cables.

K. UL 1863- Standard for Communications-Circuit Accessories.

1.3 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Installation methods.

B. Shop Drawings: Show compliance with requirements on isometric schematic diagram of network layout, showing cable routings, telecommunication closets, rack and enclosure layouts and locations, and grounding, prepared and approved by BICSI Registered Communications Distribution Designer (RCDD). Provide RCDD's information to verify current certification.

1. Provide detailed drawings for telecom closets showing rack positions in data rooms, rack

layouts, room layouts, patch panel choice and placement, along with cable management, drawings need to be provided prior to rough-in for campus approval.

2. Installer Qualifications. Company with a minimum of five (5) years successful installation experience with projects utilizing intra-building and inter-building copper and optical fiber cabling work similar to that required for the subject project.

3. Contractor shall provide installer-level BICSI Certification. A minimum percentage of seventy-five (75a) of installation work force shall be BICSI installer level II as well as manufacturer certified. Up to twenty-five percent (25a) of installation force may be BICSI installer level I. Work crew not involved in installing cable elements (e.p. laborers delivering/moving materials, installing grounding by an electrician, or workers installing pathways elements) do not require BICSI or manufacturer certification or registration.
4. Contractor shall provide a Manufacturer Certification for system solution, issued in company name, valid for the time frame in which the installation will be completed. Contractor must be CommScope SYSTIMAX certified as well by Corning Cable Systems.
5. Contractor shall provide a minimum of five (5) reference accounts at which similar work, both in scope and design, have been completed by the contractor within the last three (3) years.
6. Installer qualifications must meet manufacturer's requirements needed to obtain 25 year system warranty.

C. Test Plan: Complete and detailed plan, with list of test equipment, procedures for inspection and testing, and intended test date: submit at least 60 days prior to intended test date.

D. Field Test Reports: Submit all reports in electronic format.

E. Project Record Documents: Prepared and approved by BICSI Registered Communications Distribution Designer (RCDD).

1. Record actual locations of outlet boxes and distribution frames.
2. Show as-installed color coding, pair assignment and cross-connect layout.
3. Identify distribution frames and equipment rooms by room number on contract drawings.

F. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions: include copy of project record documents.

G. Provide a spreadsheet of what wiring labels correspond to what rooms foe lighting AP's before students move in, and turn over to campus IT staff. Provide with testing details well before network is expected to light wired and wireless networking.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: At least 3 years' experience manufacturing products of the type specified.

B. Installer Qualifications: A company certified by the chosen manufacturer for a minimum of 3 years and having at least 3 years experience in the installation and testing of the cable system specified.
   1. Submittals must include manufacturer certification showing date of certification and that certification is current.
   2. Supervisors and installers factory certified by manufacturers of products to be installed.
   3. Employing BICSI ITS installer 2, copper training - with a minimum 3 years experience for all work.
   4. Provide technicians information to verify certification.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Cabling and Equipment:

   1. Systimax/Commscope XL category 6 with Gigaspeed XL 2071 Category 6 UTP cable, slate grey insulation jacket or approved equal.
   2. Systimax X10D category 6A with Gipaspeed X1OD MGS600 series information Outlet for use with all riser applications, slate grey insulation jacket or approved equal.

2.2 SYSTEM DESIGN

A. Provide a complete permanent system of cabling and pathways for voice and data communications, including cables, conduits and wireways, pull wires, support structures, enclosures and cabinets, and outlets as indicated on the Drawings. The Category 6 Data system shall be an integrated high-performance system with all Cat 6 cable, patch panels, jacks, and other components manufactured by the same manufacturer and warranted for minimum of 25 years. All data cabling systems shall include a twenty-five (25) year application assurance warranty as a manufacturer registered system installation. Basis of Design is Commscope Systimax GIGASPEED XL7 System.

   1. Comply with TIA/EIA-568-D and TIA/EIA-569-D-1, latest editions.
   2. Provide fixed cables and pathways that comply with NFPA 70 and ANSI/J-STD-607 and are UL listed or third-party independent testing laboratory certified.
   3. Provide connection devices that are rated for operation under conditions of 32 to 140 degrees F at relative humidity of 0 to 95 percent, noncondensing.
   4. In this project, the term plenum is defined as return air spaces above ceilings, inside ducts, under raised floors, and other air-handling spaces.

B. Main Distribution Frame (MDF): Centrally located support structure for terminating, riser cables functioning as point of presence to external service provider.
   1. Locate main distribution frame as indicated on the drawings.
   2. Capacity: As required to terminate all cables required by design criteria, maximum fill for conduits is 40a. Provide 25a spare space, this includes adding conduits as required.

C. Intermediate Distribution Frames (IDF): Support structures for terminating horizontal cables that extend to telecommunications outlets.
   1. Locate intermediate distribution frames as indicated on the drawings.

D. Riser Cabling: Cabling, pathways, and terminal hardware connecting intermediate distribution frames (IDF's) with main distribution frame (MDF), wired in star topology with main distribution frame at center hub of star. All riser cables are to be category 6A. Category 6 riser cables will not be accepted.

E. Cabling to Outlets: Specified horizontal cabling, wired in star topology to distribution frame located at center hub of star: also referred to as “links”. All horizontal cabling shall be category 6A.

2.3 PATHWAYS

A. Conduit: As specified in EIA/TIA 569-A, Commercial Building Standards for Telecommunications and Spaces provide pull cords in all conduits.
B. Cable Trays: As specified in EIA/TIA 569-A, Commercial Building Standards for Telecommunications and Spaces.

2.4 COPPER CABLE AND TERMINATIONS

A. Copper Horizontal Cable: TIA/EIA-568-D Category 6 solid conductor unshielded twisted pair (UTP), 24 AWG, 100 ohm: 4 individually twisted pairs: covered with grey jacket for data or voice, complying with all relevant parts of and addenda to latest edition of TIA/EIA-568 and UL 444.
B. Copper Riser Cabling: TIA/EIA-568-D Category 6A solid conductor unshielded twisted pair (UTP), 23 AWG, 100 OHM: 4 individually twisted pairs: covered with prey jacket, complying with all relevant parts of and addenda to latest edition of TIA/EIA-568-D and UL 444.
C. 1, In locations other than in plenums, provide, NFPA 70 type CMG general purpose, CMR riser rated, or type CMP plenum rated cable.
   1. In plenums, provide NFPA 70 type CMP plenum-rated cable.
   2. Testing: Furnish factory reel tests.

D. Copper Cable Terminations: Insulation displacement connection (IDC) type using appropriate tool.

E. Jacks and Connectors: RJ-45, non-keyed, terminated with 110-style insulation displacement connectors: high impact thermoplastic housing: complying with same standard as specified horizontal cable and UL 1863.

   1. Performance: 500 mating cycles.
   2. Voice Jacks: Blue, 4-pair, pre-wired to T568B configuration.
   3. Data Jacks: Blue, 4-pair, pre-wired to T568B configuration.
   4. Cat 6 terminations shall be type B.

2.5 FIBER OPTIC CABLE AND ADAPTORS

A. Fiber Optic Backbone Cable: Hybrid-fiber, with 12 strand (6-pair) Sinple-mode 8/1 25um complying with TIA-492AAA: covered with orange cable jacket and complying with relevant portions of and addenda to latest edition of TIA/EIA-568-D.

1. In locations other than in plenums, provide NFPA 70 type OFNR nonconductive-riser rated or type OFNP nonconductive-plenum-rated cable.
2. In plenums, provide NFPA 70 type OFNP nonconductive-plenum-rated cable.
3. Testing: Furnish factory reel tests.

B. Fiber Optic Adapters and Connectors: Duplex SC, push-on-push-off type, single mode adaptors with zirconia ceramic alignment sleeves: complying with relevant parts and addenda of TIA/EIA-568-D and maximum attenuation of 0.3 dB at 1310 and 1550. Corning UPC, or accepted equal.

2.6 CROSS-CONNECTION EQUIPMENT

A. Patch Panels for Copper Voice or Data Cabling: Sized to fit EIA standard 19 inch wide equipment racks: 0.09 inch thick aluminum: cabling terminated with 50 -pin RJ-21 (Amphenol) connectors.
   1. Jacks: Non-keyed RJ-45, suitable for and complying with same standard as cable to be terminated: maximum 48 ports per standard width panel.
   2. Capacity: Provide ports sufficient for cables to be terminated plus 25 percent spare.
   3. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively: comply with TIA/EIA-606 using encoded identifiers. Labels should be as follows: (Same on both ends) - IDF Room # - Rack# (If multiple) - Patch panel letter (A at top Z at bottom) - Numerical location in patch panel. For example - "101-2-A-34" = IDF 101, Rack 2, Patch Panel A, Jack 34.
   4. Provide incoming cable strain relief and routing guides on back of panel.
   5. Patch Cords: Provide one patch cord for each patch panel port. Patch cords to be Spring Green for data, 10a should be white for VOIP or analog dial-tone. Length to be determined by needs of SUNY New Paltz IT Director, Jay Palen, based on rack and equipment locations, minimum 7 feet, maximum 14 feet.

B. Patch Panels for Fiber Optic Cabling: Sized to fit EIA standard 19-inch-wide equipment racks: 0.09 inch thick aluminum.
   1. Adaptors: As specified above under FIBER OPTIC CABLING: maximum of 24 adaptors per standard panel width.
   2. Labels: Factory installed laminated plastic nameplates above each port, numbered consecutively: comply with TIA/EIA-606 using encoded identifiers.
   3. Provide incoming cable strain relief and routing guides on back of panel.
   4. Provide rear cable management tray at least 8 inches deep with removable cover.
   5. Provide dust covers for unused adaptors.
   6. Patch Cords: Provide one patch cord for each pair of patch panel ports. Patch cord insulation jacket color to be spring green, unless directed otherwise by SUNY New Paltz IT Director, Jay Palen.

2.7 ENCLOSURES

A. Backboards: Interior grade plywood without voids (Grade AC, with "A" side out), 3/4 inch thick: UL-labeled fire-retardant.
   1. Provide backboards on three walls of each Communication closet, per College Telecom direction.
      a. Paint with 2 coats of flat prey fire-retardant paint. Do not paint over UL label.

B. Equipment Racks and Cabinets: CEA-31 0 standard 19-inch-wide component racks.
   1. Wall Mounted Racks: 18" deep, MINIMUM 49" high: with front swing gate: black

finish.
2. Standard Floor Mount Racks: As applicable, must be pre-approved by SUNY Telecommunications.
3. Provide 2U cable management per 2U patch panel. Provide 2U cable management per 1U switch.
4. Face Plates: Location of face plates should not coincide with the end of the student bed.

C. Outlet Boxes: For flush mounting in walls: depth as required to accommodate cable manufacturer's recommended minimum conductor bend radius.
1. Size, Unless Otherwise Indicated: 4 inches square by 2-1/8 inches deep.
2. Wall-Mounted Telephones: 4 inches high by 2 inches wide by 2-1/8 inches deep.
3. Faceplates: High impact thermoplastic, complying with system design standards and UL 514C.
4. Labels: Comply with TIA/EIA-606 using encoded identifiers: label each jack on the face plate as to its function with a unique numerical identifier.

PART 3 EXECUTION

3.1 INSTALLATION - GENERAL

A. Comply with latest editions and addenda of TIA/EIA-568, TIA/EIA-569: ANSI/J-STD-607, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

B. Comply with latest editions and addenda of TIA-570, ANSI/J-STD-607, NFPA 70, and SYSTEM DESIGN as specified in PART 2.

3.2 PATHWAYS

A. Install with the following minimum clearances:
1. 48 inches from motors, generators, frequency converters, transformers, x-ray equipment, and uninterruptible power systems.
2. 12 inches from power conduits and cables and panelboards.
3. 5 inches from fluorescent and high frequency lighting fixtures.
4. 6 inches from flues, hot water pipes, and steam pipes.

B. Conduit:
1. Do not install more than 2 (two) 90-degree bends in a single horizontal cable run.
2. Leave pull cords in place where cables are not initially installed.
3. Conceal conduit under floor slabs and within finished walls, ceilings, and floors except where specifically indicated to be exposed.
4. Conduit may remain exposed to view in mechanical rooms, electrical rooms, and telecommunications rooms.
5. Treat conduit in crawl spaces and under floor slabs as if exposed to view.
6. Where exposed to view, install parallel with or at right angles to ceilings, walls, and structural members.
7. fill shall not exceed 40%. Each conduit end shall be equipped with protective insulator.

C. Grounding and Bonding: Perform in accordance with ANSI/J-STD-607 and NFPA 70.
D. Firestopping: Seal openings around pathway penetrations through fire-rated walls, partitions, floors, and ceilings in accordance with Section 07270.

E. All cable shall be in conduit or cable tray as indicated on drawings.

3.3 INSTALLATION OF EQUIPMENT AND CABLING

A. Cabling:
   1. Do not bend cable at radius less than manufacturer's recommended bend radius: for unshielded twisted pair use bend radius-of not less than 4 times cable diameter.
   2. Do not over-cinch or crush cables.
   3. Do not exceed manufacturer's recommended cable pull tension.
   4. When installing in conduit, use only lubricants approved by cable manufacturer and do not chafe or damage outer jacket.
   5. Cable termination documentation must be turned over to campus IT prior to telecommunication room completion.

B. Service Loops (Slack or Excess Length): Provide the following minimum extra length of cable, looped neatly:
   1. At Distribution Frames: 120 inches.
   2. At Outlets - Copper: 12 inches.

C. Copper Cabling:
   1. Category 6: Maintain cable geometry: do not untwist more than 1/2 inch from point of termination.
   2. For 4-pair cables in conduit, do not exceed 25 pounds pull tension.
   3. Provide (2) spares to the furthest point from the closet in each wing. cable shall be a different color or as directed by SUNY New Paltz IT Director, Jay Palen.
   4. Cat6 terminations shall be type B
   5. Category 6A: Terminate as per manufacturer.

D. Fiber Optic Cabling:
   1. Prepare for pulling by cutting outer jacket for 10 inches from end, leaving strength members exposed. Twist strength members together and attach to pulling eye.
   2. Support vertical cable at intervals as recommended by manufacturer.

E. Field-Installed Labels: Comply with TINEIA-606 using encoded identifiers.
   1. Cables: Install color coded labels on both ends.
   2. Outlets: Label each jack on its face plate as to its type and function, with a unique numerical identifier.
   3. Patch Panels: Label each jack as to its type and function, with a unique numerical identifier.
   4. Conduits: Label each end of each conduit with its destination. For example, one end is labeled “To room 130, and the other end is labeled “To room 100".

F. Telecomm rooms need to be turned over in clean and secure state, a minimum of 21 days in advance of building turnover.

G. Network Switches and wireless access devices will be provided and installed by the Campus. Contractor responsible for all wiring, terminations, and testing.

E. General Wireless Access Point (WAP) Installation Guidelines:

1 WAP electronics will be purchased and installed by the Campus. Specific vendor or model of wireless gear should not be in the building specs. Infrastructure, cabling, and junction boxes to be provided and

installed by the Contractor.

2 Each WAP location will have one CAT 6A cable terminated in each AP location. For solid surface mounting 2-gang "mud rings" are acceptable as long as they provide the same screw mounting hole placements as 2-gang boxes and can fully support the weight of AP electronics mounted on the ring.

F. Wall Mounted WAP Guidelines:

1 For vertical wall mounted WAPs: all WAP locations are to be mounted on a 2-gang box flush with the wall.

2 The following guidelines for height and distances are to be followed for determining where to provide gang boxes for mount WAPs onto walls:

3 For wall mounted WAP: the minimum height distance between ceiling or highest obstruction on wall to center of gang box is 12 inches - This minimum distance between the WAP and the ceiling is required to accommodate future changes in WAP ever be closer than 12" from center of gang box to finished ceiling for wall mounted WAPs or any obstruction that would impede installing a large unit or external antennas. The minimum height Above Finished Floor (AFF) to bottom of the gang box is 7 feet.

4 The maximum height Above Finished Floor (AFF) to bottom of the gang box is 10 feet.

5 The side edge of gang box should be no closer than 12" to adjacent perpendicular surface (wall meeting wall or other large obstruction).

6 If a ceiling gets lowered during construction the gang boxes are also to be lowered to preserve the 12-inch distance minimum.

G. Ceiling Mounted WAP Guidelines:

1 For horizontal ceiling-based mounting of WAPs on hard surfaces: WAPs are to be mounted on 2-gang boxes flush with the ceiling.

2 The following guidelines for height and distances are to be followed for determining where to provide gang boxes for ceiling mount WAPs:

3 Ceiling mounted WAP should never be mounted on finished ceilings that are more than 12 feet above finished floor.

4 Do not put WAPs above a ceiling surface such as suspended foam panels or drop ceilings that would break line of sight between wireless client devices and the WAPs. Doing so interferes with higher frequency using devices and makes maintaining WAPs without damaging ceiling surfaces to be near impossible. Moving WAPs to another location or using pendant mounts may need to be considered in these cases.

5 WAP location should be level with or just below any obstructions protruding from the ceiling - placing an WAP above large suspending lighting would cause the lighting to degrade or interfere with a ceiling mounted AP's radiation pattern. For areas with expose ceilings this may require a pendant mount arrangement to make sure WAPs are at the same level as or below lighting.

6 Bottom of gang box or equivalent should be flush with the bottom of finished ceiling to facilitate flush mounting of WAP and WAP mounting kit onto gang box - WAP mounting kit will be larger than gang box.

7 Do not put WAPs on ceiling surfaces with that are not level, flat, and smooth (no "wavy", curved, or "interesting" surfaces that would impede the correct flush attachment of WAP mounting kits to the gang box).

8 Gang box to be a minimum of 12" away from any lighting fixtures and fluorescent lamp ballasts to minimize radio interference.

9 Gang box to be a minimum of 12" away from any fire alarm fixture or audio visual components such as speakers to avoid introducing interference to the AP and noise in analog audio circuits.

10 The side edge of gang box should be no closer than 12" to adjacent perpendicular surface (wall to ceiling, ceiling to fixture or obstruction).

11 Gang box or equivalent in ceiling must be able to support WAP weight.

12 For horizontal ceiling-based mounting of WAPs on a “Dropped Ceiling” featuring tiles and a grid of metal channels the WAPs are to be mounted to

2-gang boxes flush with the bottom of the ceiling with appropriate structural support channels.

13 For horizontal ceiling-based mounting of WAPs on open ceilings: WAPs must be installed on a 2-gang box suspended on a pipe pendant. 2-gang box on pendant must be located at or below the level of all lighting fixtures, HVAC, etal.

3.4 TESTING

A. UTP Cable Testing - Riser and inter-building distribution cable testing: Each cable pair within all UTP riser cables shall be tested for continuity to ensure conductors are terminated in proper sequence, with correct polarity (tip and ring), and without conductor-to-conductor shorts, conductor-to-ground shorts, or opens.

B. Horizontal Cable Testing - All UTP station cables shall be tested to prove compliance with the current industry standard, TIA-568-B.2-1 Part 2: Balanced Twisted Pair Cabling Components, Addendum 1 - Transmission Performance Specifications for 4-pair 100 ohms Category 6 Cabling and any subsequent addenda. Channel tests are the only acceptable test format for testing Category 6 cabling. Link test will not be sufficient.

C. Horizontal Cable Testing Equipment - The testing of UTP station cables shall be performed using the recommended test equipment specifically designed to test cables for all Category 6 parameters from 0 - 250 MHz. Testers shall be loaded with the most recent test values per the above referenced standard. The contractor may be required to provide documentation (or demonstration) that the testers used are properly programmed as described above.

D. The field test equipment shall meet the requirements of ANSI/TIA/EIA-568-A including applicable Technical Service Bulletins and amendments. The appropriate level III tester shall be used to verify Category 6 cabling systems.

E. Fiber Optic Cable Testing
   1. Inter-building cable testing requirements:
      a. Test multi-mode strands at 850 nm and 1300 nm.
      b. Test single-mode strands at 1310 nm and 1550 nm.
      c. Use optical time domain reflectometer (OTDR) for tests.
      d. Record signature trace, length, and attenuation.

F. Submission prior to acceptance, the contractor shall submit a copy of all applicable test results to the Owner/Technology Consultant in both electronic (file) and paper form.

G. Category 6 and 6A UTP cables - Each cable type should be tested to conform to its associated EIA/TIA and manufacturer's specification for the specific category of cable. The test results

submitted for Category 6 and 6A UTP cables shall include the following:

1. Graphical/numerical data. Both graphical data plots and numerical are required for the following test parameters:
   a. NEXT
   b. PS NEXT
   c. ELFEXT
   d. PS ELFEXT
   e. Attenuation
   f. Return loss
2. Numerical data. Numerical data only is required for the following test parameters:
   a. Propagation delay
   b. Delay skew
   c. Resistance

H. UTP Riser Cables - Continuity tests shall be performed on each pair. The contractor shall submit a document confirming that these cables were tested satisfactorily per these guidelines.

3.5 SYSTEM WARRANTY

A. Installer qualifications must meet manufacturer's requirements needed to obtain 25 year system warranty.

B. All data cabling systems shall include a twenty-five (25) year application assurance warranty as a manufacturer registered system installation.

END OF SECTION

SECTION 275117 - INTERTELECOMMUNICATION AND MASS NOTIFICATION SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Mass Notification System conforming to the SUNY New Paltz Campus Standards

1.2 REFERENCE STANDARDS

A. NFPA 70 - National Electrical Code: National Fire Protection Association; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

B. NEC - National Electric Code.

C. ANSI - American National Standards Institute.

D. NEMA - National Electric Manufacturers Association.

E. EIA/TIA - Electric/Telecommunications Industries Association.

F. BICI - Building Industry Consulting International.

G. UL- Underwriters Laboratories.

H. ASA - American Standards Association.

I. FCC - Federal Communications Commission.

J. OSHA - Occupational Safety and Health Administration.

K. ASTM - American Society of Testing Materials.

L. UBC - Uniform Building Code.

M. ADA - American's with Disabilities Act

N. NFPA 72 (2010)

1.3 SYSTEM DESCRIPTION

A. The mass notification system will seamlessly integrate into a voice-capable FACP utilizing contact closure and line level audio, using the fire alarm system speakers. The system will communicate using the universal wires interface and IPC communicator.

1.4 SUBMITTALS

A. Shop Drawings: Indicate electrical characteristics and connection requirements. Indicate layout of equipment mounted in racks and cabinets, component interconnecting wiring, and wiring diagrams of field wiring to speakers and remote input devices.

B. Product Data: Provide data showing electrical characteristics and connection requirements for each component.

C. Product Data: Provide dimensions, ratings, and performance data.

D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

F. Operation Data: Include instructions for adjusting, operating, and extending the system.

G. Maintenance Data: Include repair procedures and spare parts documentation.

1.4 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70 and Federal Communications Commission.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience with service lac ties within 150 miles of Project - "Manufacturer's Support Letter".

C. Supplier Qualifications: Authorized and supported factory distributor of specified manufacturer's documentation that they are certified to sell, install, and manufacturer with minimum five years documented experience. Distributor shall provide maintain equipment being proposed.

D. Installer Qualifications: Authorized installer of specified manufacturer with service lac ties within 150 miles of Project. Installers shall be documented factory trained technicians. Installers who have factory trained technicians in other offices, not serving this territory, shall not be qualified and will be rejected.

E. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Universal Informacast / Singlewire Mass Notifications System.

B. This product is Proprietary as approved by SUNY - New Paltz as a sole source exempt material to meet the college requirements. No product substitutions will be considered.

C. The Contractor for this work shall be held to have read all of the Bidding Requirements, the General Requirements, and Contract Proposal Forms: and in the execution of this work, he will be bound by all of the conditions and requirements therein.

D. The contractor shall be responsible for providing a complete functional system including all necessary components whether included in this specification or not.
E. Provide all programming as required for new and existing equipment for a fully operational system.

F. In preparing the bid, the bidder should consider the following:
   1. No claim will be made against the owner for any costs incurred by the bidder for any equipment demonstrations which the owner requests.

2.2 SYSTEM DESIGN

A. System designed is based on the Informacast / Singlewire network system.

2.3 COMPONENTS

A. IPC IP Communicator:

   1. The communicator can act as a end-node as well as a relay, extending the reach of the network to cover all areas of interest.
   2. Capable of driving audible, visual, and other data devices.
   3. Fully integrated unit with integral power supply and audio amplifiers.
   4. Receives and transmits digital signals.
   5. Has unique address in the Informacast / Singlewire network and is individually software controlled from each base station PC.
   6. Provides outputs for channels of wideband amplified audio, channels of wideband Iin-level audio, one full duplex RS-232 data channel, one analog input, one digital input, and two digital I/O data pins.
   7. Provides supervisory built-in self-tests (BIT) that are reported periodically or on demand to the base station where they are displayed and lopped.
   8. World-wide, license-free operation at 2.4GHz.
   9. Synchronized audio and visual message output.
   10. Auto sensing 100-240V AC.
   11. Auto-diagnostics, fully supervised operation.

B. Uninterruptable Power System (UPS-901)

   1. for use with the TRX-401 Field Transceiver in Informacast / Singlewire.
   2. During normal operation the UPS-901 receives a trickle charge from the associated TRX-401 unit.
   3. Balancing circuit is used to maintain an optimal float charge on the battery.
   4. Power failure will automatically supply DC power to the transceiver.
   5. Automatically transfers power back to the utility power when line voltage returns to normal.
   6. Mounts securely to associated TRX via built-in mounting tracks.

C. Universal Informacast / Singlewire Interface UWI-1301-VXR

   1. Provides interface from Informacast / Singlewire Mass Notification System to third party vendor. systems.
   2. Distributes messages through voice capable Fire Alarm Control Panels
   3. Provides Informacast / Singlewire transceiver units with one or more contact closure outputs. These outputs are used to interface with other systems and are independently

controlled by Informacast / Singlewire.

4. Receives power line-level audio, and responds to serial commands from the host transceiver through its RS-232 port.
5. Simplifies wiring by bundling line-level audio from the transceiver and Push-To-Talk contact closure in a single interface cable 17 feet long.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Splice cable only in accessible junction boxes or at terminal block units.

C. Make cable shields continuous at splices and connect speaker circuit shield to equipment ground only at amplifier.

D. Install input circuits in separate cables and raceways from output circuits.

E. Provide protection for exposed cables where subject to damage.

F. Support cables above accessible ceilings to keep them from resting on ceiling tiles. Use spring metal clips or plastic cable ties to support cables from structure for ceiling suspension system. Include bridle rings or drive rings.

G. Use suitable cable fittings and connectors.

H. Ground and bond equipment and circuits in accordance with Section 260526.

I. Provide programming of the new transceivers, existing transceivers, and existing base station as required for a fully operational system.

J. Provide posted instructions at FACP for one-way voice communication.

3.2 FIELD QUALITY CONTROL

A. Contractor Field Service:

1. Provide services of a service representative for this project location to supervise the field assembly and connection of components and the pre-testing, testing, and adjustment of the system.
   a. Include making final wiring connections, inspection and adjustment of complete instillation, and systems demonstration.

B. Measure and record sound power levels at designated locations.

C. Certify that installation is complete and performs according to specified requirements.

3.3 MANUFACTURER'S FIELD SERVICES

A. Provide site survey as required for RF signal strength.

B. Provide the services of manufacturer's technical representative to prepare, start and test the system.

C. Include making final wiring connections, inspection, adjusting, and programming of the completed installation, and systems demonstration.

D. Certify that installation is complete and performs according to specified requirements.

3.4 ADJUSTING

A. Prior to final acceptance, inspect system adjust as required, and replace parts which are found defective.

B. Adjust for appropriate sound levels.

C. Adjust devices and wall plates to be flush and level.

3.5 CLOSEOUT ACTIVITIES

A. Demonstration: Demonstrate operation of system to Owner's personnel.
   1. Use operation and maintenance data as reference during demonstration.
   2. Conduct walking tour of project.
      a. Briefly describe function, operation, and maintenance of each component.

B. Training: Train Owner's personnel in the procedures involved in operating, maintaining, adjusting, making changes to and preventative maintenance of the system.
   1. Use operation and maintenance manuals as training reference, supplemented with additional training materials as required. At the end of training, Owner's Representative shall be capable of making changes to the system without having to contact manufacturer or manufacturer's representative to make changes to the system.
      a. Train Owner's personnel on programming equipment for starting up and shutting down, troubleshooting, servicing and maintaining equipment.
   2. Provide minimum of one day of training.
      a. For the first year, after the initial Owner's training, provide up to three (3) training sessions for personnel upon the request of the Owner.
   3. Instructor: Manufacturer's training personnel.
   4. Location: At project site.

3.6 CLEANING AND PROTECTION

A. Prior to final acceptance, clean system components and protect from damage and deterioration.

3.7 TESTING

A. All devices must be tested to verify proper operation. Submit written test results to certify a completed system.

3.8 MAINTENANCE SERVICE

A. Execution Requirements: Furnish service and maintenance of the system components for one year from the Date of Substantial Completion. This shall include all recommended and required preventative maintenance inspections/testing as outlined by the manufacturer and repairs to manufacturer or installer defects. All of this shall be provided at no charge to the Owner. Contractor at the completion of work shall submit to the Owner and Owners Representative a schedule indicating when inspections/testing will be conducted and an outline indicating what inspections/testing will be conducted on the system during the warranty period.

B. All system service calls during the warranty period shall be handled in the following manner:
   1. Owner shall contact the Electrical Contractor and initiate a service call who in turn shall

contact the equipment vendor to respond and investigate the source of the service call.

2. If the equipment vendor establishes that the source of the service call is related to the electrical installation, the equipment vendor shall contact the Electrical Contractor for warranty service.
3. The Owner shall not be responsible for any charges during the warranty period that result in the Owner notifying the installing contractor of a defect in the system.
4. During construction and warranty period there shall be a required one-hour phone response and a four hour on site response by a qualified technician time limit. All response outside of this service is in breach of contract.

3.9 WARRANTY

A. Call back response time shall be 24 hours 7 days a week.

B. On-site response time shall be 24 hours 7 days a week.

END OF SECTION

SECTION 27 53 19 - EMERGENCY RESPONDER RADIO SYSTEM

PART 1 – GENERAL

1.1 EMERGENCY RESPONDER RADIO SIGNAL AMPLIFICATION SYSTEM (BDA SYSTEM)

A. General

1. Provide an in-building radio signal amplification system to provide complete coverage in the building for the public safety agencies as required by the local fire department and other agencies and authorities having jurisdiction. System users shall receive and transmit radio broadcasts from their portable radio units within the building. This shall be accomplished utilizing the following components:
   a. Bi-Directional Amplifiers (Signal Boosters)
   b. Plenum rated Coaxial Cable
   c. Antennas
   d. Cable taps
   e. Connectors
   f. Power dividers
   g. Other components and interconnecting circuitry as required

2. The system shall comply with the requirements of the International Building Code, NFPA-72, and NFPA 1221, Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems, editions as referenced by the NY Building and Fire Codes.
3. The entire system shall meet with approval of the Fire Department, the Building Department and all other agencies and authorities having jurisdiction (AHJ).
4. The work in this section shall include the responsibility for all fillings with the AHJ, as required. This responsibility shall include furnishing of floor plans, descriptive notes and/or specifications, wiring diagrams, certifications, shop drawings and amendment forms.
5. Early completion of the in-building radio communication enhancement system will be required so as to permit a Certificate of Occupancy to be obtained in a timely manner.
6. Any permits necessary for the installation of the work shall be obtained prior to the commencement of the work. All permit costs and inspection fees shall be included as the part of the required work.
7. System shall be compatible radio systems indicated on the system drawings.

B. Design requirements

1. In-building radio signal amplification systems for emergency responders are an integral component of the life safety equipment of a building or structure. The primary function is to provide reliable emergency responder communications at the required signal strength within the specified areas.

C. Critical Areas such as exit stairs, exit passageways, elevator lobbies, sprinkler sectional valve locations, fire alarm control panel locations, and similar critical areas shall be provided with 99% floor area radio coverage.

1. General building areas shall be provided with 95% radio coverage, as specified by AHJ.
2. The In-building radio signal amplification systems must provide the following signal strengths:
   a. Downlink - Minimum signal strength to provide DAQ (Delivered Audio Quality)

of 3.4.

b. Uplink - Minimum signal strength to provide DAQ 3.0.

3. The system shall be complete with all components and wiring required for compliance with all applicable codes and regulations, and for its operations described hereinafter.
4. An approved manufacturer or a qualified and approved radio systems vendor to supply, test and determine locations of components which are required for proper operation as well as to supply, deploy, test, and certify the performance of the complete system. Vendor qualifications must also be acceptable to the AHJ.
5. All installation and testing personnel shall be certified and authorized by the signal booster manufacturer in the installation and operation of their equipment. Personnel qualifications must also be acceptable to the AHJ.
6. The system design is based on the RSI branded line of Public Safety NFPA-72 and FCC compliant Signal Boosters as manufactured by Radio Solutions, Inc. to establish standards of quality for materials and performance. The naming of a specific manufacturer or a catalog number does not waiver any requirement or performance of individual components described in the specifications.
7. Assembly and installation of all components of the Emergency Responder Radio Communication Enhancement System shall comply with all applicable sections of the National Electrical Code.
8. Survivability from attack by fire shall meet NFPA 72, National Fire Alarm and Signaling Code, current edition.
9. The system must comply with all applicable sections of the FCC rules. Signal booster shall have FCC certification prior to installation.
10. Antenna isolation shall be maintained between the donor antenna and all inside antennas to a minimum of 20dB under all operating and environmental conditions.

D. Technical Specifications and Performance Requirements: The system specified is based upon RSI branded line of Public Safety NFPA-72 compliant signal boosters.
1. The signal booster shall be either a Class B or a Class A Public Safety type as designated by the FCC and as required by the AHJ.
2. The secondary power supplies, battery chargers and system monitoring shall be fully compliant with NFPA-72, 2022 edition and NFPA 1225, 2022 edition. The signal booster shall have both the primary and the secondary power supplies fully enclosed in a sealed, non-vented NEMA-4 enclosure.
3. All signal boosters and other active system components must have FCC certification prior to installation. The equipment FCC ID must be shown on the product brochures and technical submittals. The ID must also be displayed on the product as required by the FCC.
4. Equipment installation must be done in accordance with the OEM (original equipment manufacturer) specifications. External filters, attachments or other non-approved aftermarket modifications of the original equipment shall not be accepted.
5. The signal booster shall be set and tuned by the equipment manufacturer to pass all frequencies specified by the local fire department.
6. To reduce the possibility of unwanted interference affecting the operation of the system, signal boosters shall be of a band- selective or channel-selective type with a maximum 200KHz (Fc +/- 100KHz) 3dB channel bandwidth. Wide-band, non-selective signal boosters shall not be accepted unless it is required to cover multiple consecutive channels within the same band, or if specified by the AHJ.
7. Signal Boosters shall have oscillation prevention circuitry to protect the public

safety radio system in case of signal booster malfunction.

8. Signal Boosters shall have a minimum of 80dB gain. The gain shall be adjustable in a minimum of 25dB range. System gain shall be set and documented at the time of the final system test.
9. Maximum Propagation delay of the signal booster system shall be 14µs (microseconds) or as specified by AHJ.
10. The signal booster shall include built-in automatic alarming of malfunctions of the signal booster and battery system as per NFPA 72, current edition, and NFPA 1221. Aftermarket equipment add-ons and modifications to comply with this specification will not be accepted.
11. A dedicated monitoring panel shall be provided within the emergency command center or other location as designated by AHJ to annunciate the status of all signal booster locations. The monitoring panel shall provide visual and labeled indication of the following for each signal booster:
    a. Normal AC power
    b. Signal booster trouble
    c. Loss of normal AC power
    d. Failure of battery charger
    e. Low battery capacity

12. The system installation vendor shall verify the system monitoring requirements with the AHJ prior to system installation. System monitoring shall be fully compliant with the AHJ requirements.
13. All signal booster components shall be contained in a NEMA4 rated waterproof cabinet. Signal booster and battery backup enclosures shall be painted red with signage in bright yellow or as required by AHJ.

E. Installation Requirements

1. Assembly and installation of all components of the Emergency Responder Communication Enhancement System shall comply with all applicable sections of the National Electrical Code, NFPA-70, Standard for Emergency Services Communications, NFPA 1225, and the National Fire Alarm and Signaling Code, NFPA-72, current enforceable editions.
2. At least 2 independent and reliable power supplies shall be provided as specified in sections 3 and 4 below.
3. The primary power source shall be supplied from a dedicated twenty (20) ampere branch circuit and comply with NFPA-70 National Electrical Code, and NFPA 72, National Fire Alarm and Signaling Code, 2023 edition
4. The emergency responder radio coverage enhancement system shall be equipped with a secondary source of power. The secondary source of power shall be a battery system with a dedicated battery charger powered by a separate, dedicated twenty (20) ampere branch circuit. The secondary power supply shall supply power automatically when the primary power source is lost. The secondary source of power shall be capable of powering the emergency responder radio coverage enhancement system for a minimum period of 24 hours. The battery system shall automatically charge in the presence of external power input. Battery charger and all other electronic components must be fully enclosed in a non-vented NEMA-4 rated enclosure. Batteries shall be enclosed in a separate, vented NEMA rated enclosure.
5. The signal booster shall be designed to allow continued operation in adverse environmental conditions, such as high temperatures in the event heat from a nearby fire, water spray, voltage fluctuations or other abnormal conditions that

may occur during an emergency. Circuits that intentionally disable the signal booster in such situations (i.e., under/over voltage, over/under current, over/under temperature, etc.) are not acceptable, unless required for FCC regulatory or safety compliance. It is the purpose of this specification to assure the maximum possible level of communications to public safety personnel depending upon the signal booster, even to the extent of damaging the signal booster, as long as some communications benefit can be provided during the emergency.

F. External UPS (Uninterruptable Power Supplies) are not acceptable
   1. The power supply system design shall be such that neither the failure of the normal power source, the transfer to an emergency source, nor the re-transfer to the normal source shall cause an interruption or change in system status.
   2. The amplifier shall be housed in a 2-hour fire rated room or other suitable space as approved by the Engineer or Architect, or where specifically shown on the drawing.
   3. Radiating cable, if used, shall be run without conduit. All other cable can be run in conduit if required for mechanical protection of the cable, or where specified by the electrical engineer.
   4. RF Coaxial Cable shall be a fire-resistant, low-smoke type, U.L. classified as plenum. The classification shall be clearly marked on the outer surface of the cable regular intervals.

G. Acceptance and Test Procedures
   1. Acceptance testing for an in-building radio system is required upon completion of installation.
   2. The coverage testing shall be done in accordance with NFPA 72 and NFPA 1225, current edition, and as required by the local AHJ.
   3. All tests shall be conducted, documented, and signed by a person in possession of a current FCC General Radio Operator License.

H. All test records along with system diagrams, equipment specifications, user manuals, RF link budget calculations, battery backup calculation and other design data shall be submitted upon completion of the project.

END OF SECTION 27 53 19

SECTION 281300 - ELECTRONIC INTRUSION DETECTION AND ACCESS CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. Provide a complete networked, integrated Security System with door hardware, control panels, software, notification appliances, monitoring and control devices, raceway, and circuitry as indicated on the drawings and as specified herein.

1.2 REFERENCES (Most current adopted editions of the following)

A. Building Code of New York State 2020
B. Fire Code of New York State 2020
C. NFPA (National Fire Protection Association) 70 - National Electrical Code
D. NFPA (National Fire Protection Association) 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces
E. ICC/ANSI (International Code Council/American National Standards Institute) A117.1 - Accessible and Usable Buildings and Facilities
F. IEEE (Institute of Electrical and Electronics Engineers) C62.41 - Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits
G. UL (Underwriters Laboratories, Inc.) 294 - Standard for Access Control System Units
H. FCIA (Firestop Contractors International Association) - Manual of Practice
I. UL Qualified Contractor Program for Firestop Systems and Spray-Applied Fire Resistive Materials (SFRM's)

1.3 PROJECT SCOPE

A. Provide a complete and fully integrated Security Access Control System and CCTV Surveillance System for Peregrine Hall. The system shall be fully functioning and compatible with the existing campus access control and CCTV systems.

1.4 OPERATION

A. Access Control
   1. The campus access control and intrusion detection system is the S2 System, HID proximity card system card readers, and all parts and components shall be compatible with this system. CCTV Surveillance system is a combination of Axis IP network cameras and Milestone Xprotect Corporate NVR.
   2. The campus has a variety of structures with different users, requiring each case to be reviewed for specific functions and user's needs. However, a typical system includes:
   3. Typical access-controlled door system includes:
      a. A request to Enter Device - Card Reader (CR).
      b. Requests to exit device (REX)
      c. Electronic Locking Device (ELD) with manufactures recommended power Supply.
      d. Access control panel (ACP) composed of appropriate devices and power supplies. Door control module (DCM) or (ACP)
      e. Door Position Switch (DPS) or (DC)

   4. An access-controlled door system may upon request include:

a. Electronic Power Transfer Device (EPT)
b. Local Audible Device (WEST)
c. Interface with building CCTV surveillance cameras.
d. Interface to building Fire Alarm System.
e. Interface to a door power operators and handicap accessibility.
f. All of the above are linked together electronically, door device cables are gathered in a junction box and run to a central location in the building where they are connected to an access control panel.
g. Access control will be utilized on interior doors as well as exterior doors.
h. System must be compatible with the existing campus access control. system.
i. Electronic door strikes.
j. (REX) or Request to exit devices.

B. CCTV

1. Exterior mounted cameras, and interior mounted cameras are specified under spec Section 28 2300.

a. Digital CCTV systems shall be applied to provide surveillance of spaces and assets as directed by SUNY New Paltz.
b. Inter-connect with the SUNY New Paltz - Network Video Solution (NVR).

1.5 SUBMITTALS

A. Submittal Procedures: Submittal procedures as indicated in division 1 of these specifications.

B. Shop Drawings: Indicate non-typical system wiring diagram showing each device and wiring connection. Include exact part numbers of the proposed equipment in the drawings.

C. Calculations: Provide standby battery calculations for all provided power supplies with the designed equipment loads.

D. Product Data: Submit catalog data showing electrical characteristics and connection requirements with the exact part number of the proposed equipment.

E. Test Reports: Indicate procedures and results for specified field testing and inspection.

F. Electrician and Vendor to submit proof of state licensure to install Fire Alarm and Security Systems in New York State.

G. Electrician to submit proof of licensure as Master Licensed Electrician.

H. Manufacturer's Field Reports: Indicate activities on site, adverse findings, and recommendations.

I. Submit proof of contractor qualifications for installation of firestopping systems.

1.6 Submit firestopping system and material product data and UL listed firestopping details to be used for the project.

1.7 CLOSEOUT SUBMITTALS

A. Execution Requirements: Closeout procedures as indicated in division 1 of these specifications.

B. Project Record Documents: Record actual locations of access control equipment, devices, terminal cabinets, riser conduit runs, and pertinent junction boxes on contract drawings. All project record documents shall be submitted to the Owner's representative for final review prior to the commissioning of the access control system. It is absolutely imperative that record drawings be highly accurate due to the fact that system labeling is limited to prevent potential tampering due to the system's sensitive nature.

C. Operation and Maintenance Data: Submit manufacturer's standard operating and maintenance instructions for all control panels, pieces of equipment, and peripheral devices to the Owner's Representative prior to the commissioning of the access control system.

1.8 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Vendor: Licensed installer of security systems with proven experience with the S2 Enterprise and Mercury products that are being installed. The vendor must have an office within 75 miles of the job site that has fully trained service and install technicians available for customer support during and after project completion. Proof of factory training or previous experience with the exact manufacturer products being installed must be submitted.

C. Installer (Electrical Contractor): Licensed installer of fire alarm and security system in New York State. Master licensed electrician with documented experience of the installation of building access control systems.

D. Integrated Wireless, and IP-Enabled Access Control Products Supplier Qualifications: Integrated access control products and accessories are required to be supplied and installed through current members of the ASSA ABLOY "Authorized Channel Partner" (ACP) and "Certified Integrator" (CI) programs. Suppliers are to be factory trained, certified prior to project bid, and a direct purchaser of the specified product. Installers are to be factory trained, certified prior to project bid, and are responsible for commissioning, servicing, and warranting the installed equipment specified for the project. Contact **Mr. Brian Casler** (Tel: 315-254-5515) for installation authorization.

E. Contractor firestopping qualifications.

1.9 MAINTENANCE SERVICE

A. Execution Requirements: Furnish service and maintenance of the system components for two years from the Date of Substantial Completion. This shall include all recommended and required preventative maintenance inspections/testing as outlined by the manufacturer and repairs to manufacturer or installer defects. All of this shall be provided at no charge to the Owner. Contractor at the completion of work shall submit to the Owner and Owners Representative a schedule indicating when inspections/testing will be conducted and an outline indicating what inspections/testing will be conducted on the system during the course of the warranty period.

B. All system service calls during the warranty period shall be handled in the following. manner:

1. Owner shall contact the Electrical Contractor and initiate a service call who in turn shall contact the equipment vendor to respond and investigate the source of the service call.
2. If the equipment vendor establishes that the source of the service call is related to the electrical installation, the equipment vendor shall contact the Electrical Contractor for warranty service.

3. The Owner shall not be responsible for any charges during the warranty period that result in the Owner notifying the installing contractor of a defect in the system.
4. During construction and warranty period there shall be a required one hour phone response and a four hour on site response by a qualified technician time limit. All response outside of this service is in breach of contract.

1.10 MAINTENANCE MATERIALS

A. Provide one (1) controller of each type.

1.11 CONFIDENTIALITY

A. All information regarding security systems shall be considered sensitive/confidential. All system information including submittals, wiring diagrams, programming, reports, etc., shall be handled in an extremely sensitive manner so that the information is not transmitted to unauthorized persons. Authorized persons shall be considered the owner, owner's representative, installing contractor, and vendor. Installation drawings/diagrams, manuals, or any other information regarding the installation/operation of the system shall not be left unattended in the field at any time. Violations for the mismanagement of system installation information shall be swift and severe up to and including dismissal from the project.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. The S2 Enterprise@ Security Management System shall be implemented through network appliance architecture with a three-tiered modular hardware hierarchy and embedded three-tier software architecture.

1. The network appliance shall be capable of running on an existing TCP/IP network and shall be accessible, configurable, and manageable from any network-connected PC with a browser.
2. Browser access for configuration and administration of the system shall be possible from a PC on the same subnet, through routers and gateways from other subnets, and from the Internet. Control and management of the system shall therefore be geographically independent.
3. Security of the data communicated over the network to and from the browser, Network Controller, and nodes is protected by encryption (SSL 128-bit) or authentication (SHA-1)
4. The top hardware tier is the Network Controller. Embedded on the Network Controller are an operating system, a web server, security application software, and the database of personnel and system activity.
5. The middle hardware tier is the Network Node. The Network Node shall make and manage access control decisions with data provided by the Network Controller, and it shall manage the communication between the Network Controller and Application blades connected to the system's inputs, outputs, and readers. This modular design makes it possible, even during network downtime, for the system to continue to manage access control and store system activity logs. When network connectivity is re-established, the system activity logs are automatically re-integrated. The Network Node shall be manufactured by Mercury Security.
6. The bottom hardware tier is the Application Blades. These application blades shall be manufactured by Mercury Security:

c. Single Reader Access Control Blade: shall support one reader, two inputs, and two outputs.
d. Dual Reader Access Control Blade: shall support two readers, eight supervised. inputs, and six relay outputs.
e. Alarm Input Blade: shall support 16 supervised inputs.
f. Relay output Blade: shall support 16 relay outputs.

B. The S2 system shall integrate, within a browser interface, access control, alarm monitoring, video monitoring, and temperature monitoring applications. These applications shall be embedded in a three-tier software architecture.

1. The database tier shall use PostgreSQL. Postgre3QL is a full featured, high performance database management system that supports ODBC. This shall provide a small footprint, low administration, and a high reliability relational database that is embedded without requiring the use of a separate PC server.
2. The web server tier shall be based on an Apache™ embedded web server. This shall provide a graphically rich security management application through a standard web browser.
3. The security application software tier contains the business logic. This application shall also be embedded on the network device and requires no additional memory or processing power.
4. This three-tiered embedded software design runs within an embedded Linux Ubuntu operating system and shall require no client-side software other than a web browser.

C. All equipment and materials used shall be standard components, regularly manufactured, and regularly utilized in the manufacturer's system.

D. All S2 systems and components shall have been thoroughly tested and proven in actual use.

E. All S2 systems and components shall be provided with an explicit manufacturer warranty of one year for software and two years for hardware. The S2 Enterprise@ Security Management System shall meet the requirements of business and government access control systems. The system shall monitor and control facility access, and shall perform alarm monitoring, camera and video monitoring, communications loss monitoring, and temperature monitoring. The system shall also maintain a database of system activity, personnel access control information, and system user passwords and user role permissions. The system shall be controlled from a web browser and require no software installation or client licenses. The system shall provide control and access to users on Local Area Networks (LAN), Wide Area Networks (WAN), wireless networks, and the Internet. The system shall provide email and/or text message alerts for all alarm conditions and threats.

F. Widget Desktop: The S2 system shall provide a widget-based user interface that enables users to create custom monitoring layouts by selecting and arranging widgets on a desktop.

1. Each widget shall provide easy access to a frequently used function-allowing users to, for example, view an activity log, a camera view, or real-time web content.
2. System administrators can save custom layouts for subsequent call up by users, who can then arrange the widgets as desired on their desktops. The administrator shall determine which widgets are available in a layout and the extent to which users can customize the layout.
3. When composing layouts, system administrators shall have the ability to display a grid overlay on the Widget Desktop background. Whenever a widget is moved or resized, it will align with (or “snap to") the nearest intersection of lines in the grid. If the grid is saved with the layout, it will appear in the background when users view the layout.

4. The widgets that shall be available for layouts are: Activity Log, Auto-Monitor, Camera View, Clock, Duty Log Entry, Events, Explorer, Floorplans, Intrusion Panel, Passback Grace, Photo ID History, Portal Status, Portal Unlock, Statistics Block, Status, and Threat Level.
5. In addition, when the alarm workflow feature is enabled for the system, an Alarm Workflow widget shall become available for layouts. This widget shall allow operators to monitor and resolve alarms within the alarm workflow implemented for the system.
6. When composing layouts, it shall be possible to display vertical and horizontal red lines in the background to assure that positioning widgets within these lines will fit the screen of an iPad or MacBook Air.

G. System Partitioning: The system administrator shall have the ability to divide the S2 system into partitions, allowing subsets of the overall population and/or resources to be managed separately.

1. From the default Master partition, one or more additional partitions can be created.
2. Each partition shall contain some number of administrators, card holders with their credentials, and resources.
3. When performing administrative functions, the administrator of a partition shall have the ability to affect only the cardholders and resources in that partition. However, resources can be shared across partitions through the mapping of access levels from one partition to another.
4. System partitioning shall have a precision feature that allows administrators in one or more partitions to view and perform edit functions on person records that belong to another partition.
5. Administrators shall have the ability to search for person records across all partitions to which they have access. The system administrator shall have the ability to make such cross-partition searches the default for users who have access to multiple partitions.
6. After finding a person record located in another partition, an administrator shall be able to click a button to switch to that partition directly from the person record-and possibly edit the record, depending on his or her access rights in that partition.

H. The S2 system shall provide the following Access Control capabilities:

1. Login throttling, which can be enabled for the system to limit the number of login attempts from the same IP address in a given period of time.
2. Integrated photo ID creation capability with video verification.
3. User interface secured access under encrypted password control.
4. System-wide timed anti-passback function.
5. Regional anti-passback with mustering and roll call functions.
6. Region occupancy counting and control.
7. “First-in-unlock" rule enforcement.
8. Multiple access levels and cards per person.
9. 128-bit card support for Wiegand card readers.
10. Detailed time specifications.
11. Simultaneous support for multiple card data formats.Lift control.
12. Access privileges variable by threat level.
13. Scheduled portal unlock by time and threat level.
14. Card format decoder quickly discovers unknown card formats.
15. Card enrollment by reader or keyboard.
16. Compatibility with various input devices, including biometric readers.
17. Activation/expiration date/time by person with one minute resolution.
18. Access level disable for immediate lockdown.

19. Use of Threat Levels to alter security system behavior globally.
20. Duress PINs, which can be enabled for the system to allow a valid user to raise an alarm if compelled under duress to use his or her credentials (card and PIN) to allow access for another person.
21. Multiple holiday schedules.
22. Timed unlock schedules.
23. Scheduled actions for arming inputs, activating outputs, and locking and unlocking portals.
24. Optional two-man access restriction for portals, requiring two valid card reads from two separate cardholders for portal entry.
25. Card enrollment reader support.
26. Dual-reader portal support.
27. Wiegand Reader support.
28. Magnetic-stripe reader support with cards using ABA Track 2 format for up to 200 bits.
29. Wiegand keypad PIN support for 4-digit or 6-digit PINs.
30. 8-bit and 4-bit burst keypad support for 4-digit or 6-digit PINs.
31. Integration with supported alarm panels.
32. DMP intrusion panel high-level TCP/IP integration.
33. Optional storage and recall of ID photos and personal/emergency data.
34. Up to 150,000 person records.
35. Up to 20,000 credentials are stored locally. An unlimited number of credentials may be authenticated with the controller, caching the most frequently used credentials on the node.
36. Unlimited number of scheduled actions, with the controller downloading up to of 16 per node per day of the soonest-to-activate actions applying to that node, and any others remaining in the database as candidates for downloading later. Expired scheduled actions are removed automatically.
37. The system shall support tracing a person's activity in the current partition if the “Trace this person" check box is selected on the person record.

I. The S2 system shall provide the following Monitoring capabilities:
1. The Home page, which is available from the Monitor: Live Monitoring menu on Extreme, lets users view a full system summary, including the Activity Log, Auto-Monitor, and links to frequent User Tasks.
2. Common alarm panel integration for disarm on access, and arm on egress.
3. Support for the direct viewing of IP cameras.
4. Integrated real-time IP-based DVR and NVR systems with stored video replay for events.
5. Provides alarms on video loss, video motion detection, and video restore events.
6. Virtual inputs for video loss and building-occupancy-limits-exceeded.
7. Provides alarms on communication loss and temperature variation.
8. Support for the creation of custom sets of alarm event actions.
9. Provides the ability to record video and link to video for alarm events.
10. Available video control and playback through the S2 System user interface.
11. Provides the ability to assign threat levels to various alarms according to severity.
12. Provides the ability to select up to 20 levels of priority for event actions.
13. Provides the ability to enter a duty log comment into the Activity Log, or to append a unique or preset comment to a particular log entry while viewing the Activity Log.
14. Support for the display of Activity Log entries that include both the time the event occurred on the node and the time it was reported to the controller.

15. Support for electronic supervision of alarm inputs.
16. Support for the use of output relays for enabling circuits under alarm event control.
17. A monitoring desktop that integrates video, system activity logs, floorplans, ID photos, and alarm notifications.
18. Support for the creation of unlimited customized monitoring layouts through the use of widgets, including layouts sized for the iPad or MacBook Air.
19. Graphic floorplans with active icons of security system resources.
20. System user permissions to grant whole or partial access to system resources, commands, and personal data.
21. Secure access to the user interface under encrypted password control.
22. Delivery of alerts via browsers, email, and text messages.

J. The S2 system shall provide the following Video Management capabilities:
1. Real-time video monitoring displays, including unlimited cameras simultaneously.
2. Playback of event-related video.
3. Video switching and video widget pop-ups based on access activity or event activation.
4. Integrated alarm inputs from the video management system.
5. Digital playback of video events.
6. Linking of video and events based on triggers provided by the S2 system or video system.
7. Support for multiple DVR and NVR systems.

   a. Up to 64 subordinate NetVRs and up to 1024 cameras with an Enterprise Select system
   b. Unlimited for subordinate NetVRs and cameras with an Enterprise Ultra 2 system
8. Multiple pre-programmed supported cameras.
9. Recall of photo ID and real-time image for comparison.
10. Monitoring and control through a web browser interface.
11. System user permissions to grant whole or partial access to system cameras and video resources.

K. The S2 system shall provide the following Security Database capabilities:
7. Maintain data of system activity, personnel access control information, system user passwords and custom user role permissions for whole or partial access to system resources and data.
8. Partitions: It shall be possible to partition the system to create independent, virtual security management systems for multiple populations.
9. Support for the sharing of access levels and user privileges across partitions in a system.
10. Built-in Open Database Connectivity (ODBC) compliant database for personal data.
11. LDAP integration for single-user login authentication.
12. Unlimited person records.
13. Network-secure API for external application integration.
14. Extensive and easy to use custom report generator. User-defined data fields in personnel records.
15. Record recall by vehicle tag, name, or card.
16. ODBC compliant Database.
17. An API for adding to, deleting from, and modifying the database.
18. Storage of system user passwords and permissions.
19. Storage and recall of ID photos and emergency personal information.

20. Pre-defined reports on system configuration, system activity history, and people.
21. An Audit Trail report that shows changes made to the security database over a specified period of time.
    a. For each transaction listed in the report results, information is available on when the transaction occurred, who made the changes, the fields that were modified, and the original and new values.
    b. Search criteria can be applied to filter the report results, either by the person whose record was changed or by the area of the system configuration that was modified.
16. A Credential Audit report that shows all existing access cards by their current status settings. The report also shows for each card the name of the person to whom it was issued and the card number.
17. A Duty Log report shows duty log comments residing in the current security database, including archives.
    a. For each duty log comment included in the report results, information is available on when the comment was entered, who entered it, the date and time of the logged event associated with the comment, the name of the logged event, and the specific comment text.
    b. Search criteria can be applied to filter the report results, either by Operator (the user who entered the duty log comment) or by Event type.
18. English-based query language for instant custom reports.
19. Custom report writer interface that allows the interactive creation of custom reports. Reports may be saved for later reuse. No third party software (such as Crystal Reports) shall be necessary.
20. Periodic backup to on-board flash ROM and optional network attached storage (NAS), including FTP servers.
21. Periodic archive creation for historical custom reporting and improved on-board database performance.
22. Email and text messaging (SMS) alert notifications.

L. The system shall support the integration of access control hardware from Mercury Security Corp.

M. The following Mercury hardware components shall work with the S2 Controller:

17. Supported Mercury Panels:
    a. EP2500: Intelligent Controller: 32 MB RAM, Ethernet
    b. EP1502: Intelligent Dual Reader Controller: 16 MB RAM, Ethernet, 2 readers (magnetic stripe or Wiegand) 8 inputs, 4 relays
    c. EP1501: Intelligent Single Door Controller: PoE, single door, 2 readers, 2 inputs, 2 outputs
    d. Mercury firmware version 1.14.8 is supported on the above panels.
2. Supported Mercury Interface Boards (SIOs):
    a. MR-50 Reader Interface Module: 1 reader (magnetic stripe or Wiegand), 2 inputs, 2 relays
    b. MR-52 Reader Interface Module: 2 readers (magnetic stripe or Wiegand), 8 inputs, 6 relays
    c. MR-16in Input Monitor Module: 16 inputs (zones), 2 relays

d. MR-16out: Relay Output Control Module: 16 relays

2.2 SYSTEM SOFTWARE

A. Operating System and Application Software:

1. The embedded operating system for the solid-state S2 Network Controller shall be the Linux Ubuntu operating system. The S2 Enterprise Select and S2 Enterprise Ultra 2 Network Controllers shall use Linux Ubuntu 10.04 LTS (long term support) as the operating platform. The operating system kernel shall be open-source and no operating system training or certification shall be necessary.
2. The S2 system application software shall be embedded in the system. The database shall be an embedded PostgreSQL relational database requiring a small footprint and provides high reliability. The web server shall be based on an embedded Apache™ web server enabling users to access and operate the system using a standard web browser.

B. S2 Software Licensing:

1. Software licensing shall be based upon the number of readers, cameras, and select features for one Network Controller. Software license upgrades shall be available if system reader and camera capacity must be raised. The S2 user license shall be valid in perpetuity and shall include one year of software updates from the date of shipment from the factory.
   Licensing shall be controlled by a Product Key and an Activation Key. The Product Key contains the licensed system features and limits. To upgrade your system license to enable more cameras or more doors you will need a new Product Key. The Activation Key contains the warranty expiration date. The keys are locked to the system license number. The system license number shall be viewable on-screen on the Support: About page.

C. S2 Software Upgrades: Software upgrades shall be possible from a browser on any network-connected PC, by uploading a software update to the Controller. Controllers shall automatically upgrade all connected nodes. No client software installation shall be necessary.

D. Online Help and Documentation: The S2 system shall be provided with complete embedded documentation. The online documentation shall include:

1. Context-sensitive online Help. (The Help displayed is specifically relevant to the current screen.) The online Help system shall provide explanations and procedures for all monitoring, administrative, and system configuration and maintenance functions. The Help system shall have linked table of contents, a linked index, and frequently asked questions pages. Each topic shall also have links to related topics. Each Help topic shall be printable.
2. Technical Support Notes: These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics. Installation Guides: These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.
3. Video Integration Guides: These documents shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics.

E. End-User Task Guide: This document shall be in PDF format, shall be printable, and shall be linked to from the Help system table of contents, index, and related topics. S2 Support Collaboration: It shall be possible, by the use of a network Support Collaboration Tool, for a technical support specialist to connect to the S2 system and assist on-site technicians from

remote network-connected locations. It shall only be possible for an on-site system administrator or technician to initiate this connection. There shall be no way to initiate this connection from outside the secure network.

F. Floorplans: The S2 system shall provide graphic floorplan capability including graphic display of links to other floorplans, alarms, system resources such as portals, IP video cameras, inputs, outputs, and temperature monitoring points.

1. The Network Administrator holding at least a “Setup" user role shall be able to graphically configure device icons onto the floorplan images, and to upload additional floorplan images. JPEG images shall be supported, and the maximum size for a floorplan image shall be 256K.
2. It shall be possible to create floorplan groups for the purpose of assigning or withholding assignment of these groups to system user permissions known as Custom User Roles. If a floorplan group is assigned to a particular system user then the floorplans in that group shall be viewable by that system user.

G. Personnel Data: The S2 system shall maintain person data relating to access control, system user privileges, photo identification, system activity, and contact information.

1. All person data in the system shall be integrated onto one tabbed page for viewing, editing, and deletion by system users.
2. A system user holding at least an “Administer" user role shall be able to create, delete, and modify person records, including access levels.
3. A system user holding at least a “Setup" user role shall be able to configure the display of person records. For example, the user shall be able to hide various tabs, and configure the User-defined tab by changing the tab label and customizing any of the 20 data fields that appear on the tab. The user shall also be able to define UDF value lists, which can be displayed as pre-entered drop-down lists for user-defined data fields.

H. Data Import and Export: A Data Management Tool shall be provided that supports, via an API, the import and export of personnel data. This tool shall make possible the pre-populating, and ongoing populating, of cardholders into the S2 system database.

I. Data Security:

1. Communication between the S2 Network Controller and the browser shall be secured using SSL. In addition, administrative access to the security management application and the personnel data shall be password protected and controlled by roles-based authorizations.
2. Communication between the S2 Network Controller and the S2 Network Nodes shall be encrypted, and authentication/tamper detection shall be done using the SHA-1 algorithm.
3. Communication between the S2 Network Controller and other systems (when using the API) shall be secured using SSL and authentication/tamper detection shall be done using the SHA-1 algorithm.

J. Data Backups: It shall be possible to configure regular automatic database backups.

1. It shall be possible to back up a solid-state Extreme Network Controller to a built-in solid state hard drive.
2. It shall be possible to back up an Enterprise Select Network Controller and Enterprise Ultra 2 Network Controller to a built-in solid state hard drive. It shall be possible to save backups from any controller to separate network attached storage (NAS) and file transfer protocol (FTP) servers.
3. It shall also be possible to setup regular automatic creation of database archive files.

K. On-board Data Management: Each night the S2 system shall truncate a sufficient number of the oldest records held on-board to reduce the database to its set limit, if required. This shall create the needed storage space for additional system activity records. Truncation will be performed on a First-in, First-out (FIFO) basis.

L. Partitions: It shall be possible to create multiple partitions for the management of multiple security systems or multiple populations.

1. It shall be possible to limit access to the data and resources of one partition to those with permissions for that partition.
2. It shall be possible for each partition to have its own population, resources, rules, events, video management, log data, reports and network resources.
3. It shall be possible to grant Monitor, Administer, and Setup privileges for multiple partitions to the same user. It shall also be possible to create custom user roles for each partition.
4. A node can reside in only one partition. It shall be possible to create partitions without nodes.

M. User Roles and Permissions: There shall be four pre-programmed levels of User Roles, and a total of 16 possible Custom User Roles that can be configured in the system with different permissions for each user:

1. Master Partition Monitor: These users may use the functions in the Monitor menu only within the Master (default) partition. Monitor functions shall include viewing the activity log, cameras, and floorplans.
2. Master Partition Administer: These users may use the functions of both the Administration and Monitor menus only within the Master (default) partition. Administrative functions shall include adding and editing person information in the enrollment database, issuing and revoking cards, generating reports, and performing database backups.
3. Master Partition Setup: These users may use the functions of the Setup, Administration, and Monitor menus only within the Master (default) partition. Setup functions shall include defining access control, alarm event behavior, camera settings, floorplan images and configurations, holiday and time specifications. Setup functions shall also include: designation of network resources such as time and DNS servers, email and network storage settings: performance of system maintenance such as database backup and restore, software updates and file cleanups: designation of time zone, daily backup schedule and enrollment readers.
4. Full System Setup: These users may use the functions of all menus in all partitions.
5. Custom User Roles: In addition to the roles above the system shall also support the creation of detailed user permissions regarding which cameras, floorplans, elevators, events, access levels, portals, reports, and personal data fields the system user may see, edit, delete, or control.

N. Alarm Panels: The S2 system shall be capable of integrating with alarm panels, arming the panels, disarming the panels, and triggering events based upon alarm panel status.

O. DMP Intrusion Panels: The S2 system shall be capable of integrating with Digital Monitoring Products (DMP) XR500 Command Processor Panels.

1. Security administrators can use events on a DMP panel, such as a zone going into an alarm state, to trigger events in the S2 system. They can also use events in the S2 system to control operations on the DMP panel, such as the arming or disarming of an area.

2. Monitors can use the Intrusion Panel widget to view configuration and status

information for a DMP panel. They can also arm and disarm areas, bypass and reset zones, and activate and deactivate outputs associated with the panel.

P. Alarm Events: The S2 system shall be capable of managing alarm events.

1. It shall be possible to delay an input's change to the Alarm state by a specified number of seconds. The range of delay options shall be .5 seconds or 1-120 seconds.

2. It shall be possible to associate specific actions with each alarm event. These actions may include, but are not limited to:

   a. Lock and Unlock portals.
   b. Activate and Deactivate relay outputs.
   c. Arm and Disarm input groups.
   d. Pulse outputs or output groups.
   e. Arm and Disarm alarm panels.
   f. Send emails and XML messages.
   g. Move cameras to preset positions.
   h. Switch to a video monitor.
   i. Record video.
   j. Momentarily unlock portals.
   k. Display ID photos.
   I. Change the threat level for a location, and (optionally) for its sub-locations.
   m. Make entries in the activity log.
   n. Play a digital sound file: it shall be possible to specify that it play in a loop until cleared or acknowledged.
   o. Display alarms in different colors.
   p. Set a priority for an alarm (one of 20 levels, with 1 being the highest).
   q. Require a duty log entry.
   r. Clear alarm automatically or require an acknowledgement.

3. A system user holding at least a “Setup" user role shall be able to create, delete, and modify alarm system inputs, input groups, outputs, output groups, alarm panels, and events.

4. It shall be possible to trigger events based on system activity such as:
   a. Failed login attempts.
   b. Video motion detection.
   c. Camera failure and camera restore events.
   d. Valid or Invalid card reads.
   e. Portals held or forced open.
   f. Valid card reads with a specified access level.
   g. Inputs entering an alarm state.
   h. High and low temperature events.
   i. Alarm panel arming failures.
   j. Alarm panel zone faults.
   k. Tailgating and passback violations.
   I. Occupancy limit violations.
   m. Zone empty violations.
   n. Node power failure, communication failure, timeout, and tamper events.

5. It shall be possible to clone an event which creates an event with all attributes of the original, needing to change only the event's name and any attributes it will not have in common.

Q. Activity Monitoring:

1. The S2 system shall support a Monitoring Desktop that integrates video, system activity logs, floorplans, ID photos, and alarm notifications.
2. Activity Lop viewing includes one-click navigation to person records.
3. The system shall support a Widget Desktop that allows the creation of custom monitoring layouts. Within a custom layout, widgets display live video, system activity logs, alarm notifications, ID photos, floorplans, duty lop entries, portal status displays, and DMP intrusion panels.
4. Many widgets support multiple partition viewing and filtering. For example, the Activity Lop widget can display data from multiple partitions and data filtered by event type or reader group, and/or based on the text content of the event.
5. It shall also be possible to view cameras, activity lops, and floorplans on separate monitoring pages within the application.
6. The system shall support tracing a person's activity in the current partition if the “Trace this person" check box is selected on the person record. The traced activity is displayed in bold in the color selected for “Trace person lop color" on the Network Controller pape. In addition, if an event is selected for “Trace person event" on the Network Controller pape, it is triggered each time a traced person makes an access attempt. These event activations can be reported using a Trace people filter in a custom history report.

R. Network-based Camera and Video Surveillance: The system shall provide live IP video surveillance capability. The number of supported cameras shall be limited only by license. The system's video capabilities shall include video monitor switching based on access activity. The system shall provide monitoring, configuration, and administration of IP video. Cameras can be separately monitored or monitored in groups.

1. CCTV Building Surveillance shall be Axis Communications cameras & Milestone Xprotect Corporate NVR software.
2. For IP cameras for existing campus Milestone Xprotect Corporate NVR installation plus 1 year of DUP and care premium per camera.
3. Interior cameras to be Axis Communications. Refer to specification section 282300 for additional information.
4. All electronic equipment shall be installed on equipment racks. Refer to specification section 271009 Part 2.07.B for rack specifications.
5. Cameras by Axis Communications.

S. The consultant/vendor shall coordinate all security system design and installation with Facilities, Campus Telecom and all on site affected building trades (Finish Hardware, Electrical, etc.) for areas of responsibility and execution of related work.

T. Access Control:

1. The S2 system shall be able to make access control decisions, define a variety of access levels and time specifications, write system activity into a lop file, maintain a personnel enrollment database, receive signals from input devices such as door switch monitors, card readers and motion detectors, energize devices such as door locks and alarms via outputs.

2. Time Specifications: The system shall be capable of storing up to 512 time specifications. Each time specification must be assigned a unique alphanumeric name of up to 64 characters. The definition of a time specification shall require the assignment of both a start time and an end time. Each day of the week shall be individually assignable for inclusion in time specifications. Up to three holiday

groups shall be assignable for inclusion in time specifications. If no holidays are assigned to a time specification, then no holiday access shall be allowed.

a. Time specifications shall be assignable to access levels, output groups, portal groups, input groups, and alarm events.
b. Time specifications shall function appropriately per node for the time zone specified for that node.

3. Card Formats: The system shall support the use of readers that use the Wiegand Reader Interface. The system shall default to the Wiegand 26 bit format unless a different bit length format is created in the system. The system shall support but not require the use of the card facility code. The system shall also support the use of the Magnetic Stripe ABA track 2 card data formats.

   a. It shall be possible to create new card formats, designate start bits and bit lengths for facility codes and card ID numbers, as well as designate parity bits. The system shall support up to 32 different card formats. The system shall support card formats up to 128 bits.
   b. It shall be possible to reverse the read order of the bits in the facility code and/or card ID portions of a card format.
   c. It shall be possible to view and change the default parity bit definitions for a card format.
   d. The system shall support the use of the FIPS 201 (Federal Information Processing Standard Publication 201) 75 bit card format.
   e. Administrators shall be able to specify a specific number of days of non-use that will be allowed before unused cards will be disabled. Administrators shall be able to exempt individual users from this non-use rule.

4. Access Levels: The system shall be capable of storing up to 512 access levels in each partition.

   a. Each access level must be assigned a unique alphanumeric name of up to 64 characters.
   b. The definition of an access level shall require the assignment of a reader or reader group, and a time specification.
   c. It shall be possible to also assign an elevator floor group to an access level.
   d. It shall be possible to create a temporary access level by assigning an activation date and/or expiration date for any of a person's assigned access levels. It shall also be possible to have the system automatically remove a temporary access level once it has expired.

5. First-in Unlock Rule: The system shall support the use of a First-in unlock rule. It shall be possible to use this rule to control the unlock behavior of portal groups with assigned unlock time specs.

   a. The First-in unlock rule shall require a card read of a specified access level. The portals in the group shall unlock only when the rule is satisfied and the unlock time spec is valid.
   b. There can be up to 64 First-in unlock rules in the system at a time.

6. Double Card Presentation: The system shall support the use of a Double Card Presentation mode. This mode shall allow the presentation of a card twice in quick succession at a designated reader. Such a “double read" shall change the locked portal to an unlocked state until a subsequent relock event or user-designated timeout occurs. The double card presentation mode shall be enabled on an individual portal basis and shall

also require a designation on the access level assigned to the cardholder. The mode shall adhere to time spec and threat level restrictions.

7. Keypad timed unlock: It shall be possible to enable a timed unlock feature for a portal that has a combination reader/keypad device. Once this feature is enabled, any cardholder with valid access to the portal shall be able to specify how long the portal will remain unlocked.

   a. A cardholder presents his or her card and then enters the associated PIN, followed by the number sign (#) and the number of minutes (1-99) the portal should remain unlocked.
   b. The portal will remain unlocked for the specified number of minutes, unless it is closed before the timer expires. If the portal remains open after the timer has expired, a [Door Held Open] alarm will be activated.
   c. If reader/keypad devices are located on both sides of the portal, cardholders will be able to use either device to initiate a timed unlock.

8. Holidays: The system shall be capable of storing up to 30 holidays per partition. Each holiday must be assigned a unique alphanumeric name of up to 64 characters. The definition of a holiday shall require a start date and an end date. Holidays shall have the ab ty to span several days using only one holiday slot.
   Holiday definitions shall support the designation of a start time and an end time. If no start time is designated, then the system shall default to 00:00 (start-of-day). If no end time is designated, then the system shall default to 24:00 (end-of-day).
   Holidays shall require the use of 24-hour time format, e.g. 17:00 is 5:00PM.

9. Portals: A portal is any access point and each portal supports up to two access reader devices. The System User, holding at least a “Setup" user role, shall be able to view current portal definitions, change portal definitions, delete portals, and create new portals. Creating a portal defines the access and alarm behavior of the access point. This can include:

   a. Card readers and keypads.
   b. Output for locking.
   c. Input for monitoring the door switch.
   d. Input for a Request-to-Exit function.
   e. Local alarm outputs and system alarm events.

10. Portal Groups: It shall be possible to create groups of portals and to assign an unlock time specification to the entire group. All the portals in the group shall remain unlocked during the time specified.

    a. It shall be possible to use portal groups for the purpose of assigning or withholding assignment of these groups to system user permissions known as Custom User Roles. If a portal group is assigned to a particular system user then the portals in that group shall be viewable and unlockable by that system user.

11. Portal Alarm Conditions: Portals shall have four alarm conditions. The four alarm conditions are as follows:

    a. Forced: When a portal is opened and there has been no card read, nor request to exit.
    b. Held: When a portal is held open past the expiration of the shunt timer.
    c. Invalid: When the portal reader reads a card for which there is no entry in the database.
    d. Valid: When the portal reader reads a card for which there is a valid entry in

the database.

12. Two-man entry restriction: It shall be possible to require two valid card reads by different cardholders within a specified number of seconds for entry to a specific portal.

13. Anti-passback: The system shall support both regional and timed anti-passback access control. For anti-passback functions, it shall be possible to configure regions, assign readers to those regions, and specify events for response to tailgate, passback, and occupancy limit violations. It shall also be possible to designate parent regions for hierarchical anti-passback.

    a. Grace: It shall be possible for a system Monitor or Administrator to Grace card holders from passback and tailgate violations.
    b. It shall also be possible to set a specific time for all cardholders to be Graced daily.
    c. The system shall be able to automatically place the cardholder in a predefined region upon the selection of the grace option.

14. Mustering: To aid in evacuation management it shall be possible to designate a region or regions for mustering. It shall be possible to quickly get an occupancy count and occupant list for any region.

15. Scheduled Actions: It shall be possible to specify system actions to occur at scheduled times. When scheduling an action, it shall be possible to specify whether the time specifications for the scheduled action will be based on the time zone set for the local Network Node or the time zone set for the Network Controller. Scheduled actions can include:

    a. Arming and disarming inputs.
    b. Activating and deactivating outputs.
    c. Locking and unlocking portals.

16. Floorplans: The system shall be capable of displaying active graphic floorplans and configuring each floorplan with icons representing system resources: cameras, portals, temperature points, and alarms. A network administrator holding at least a “Setup" user role shall be able to upload floorplan images and graphically configure device icons onto the floorplan images. Viewing floorplans will require the Macromedia Flash Player 9.0 plug-in for the browser.

    a. It shall be possible to create floorplan groups for the purpose of assigning or withholding assignment of these groups to system user permissions known as Custom User Roles. If a floorplan group is assigned to a particular system user then the floorplans in that group shall be viewable by that system user.

17. Lift Control: The system shall be capable of controlling lift access to lounge.

U. Threat Levels:

5. It shall be possible to configure up to eight threat levels. It shall be possible to alter security system behavior through the use of threat levels. Groups of threat levels may be created and assigned to portal groups, access levels, input groups, output groups, floor groups, and event actions. The behavior of groups, access levels, and event actions with assigned threat level groups shall change based upon the current system threat level.

6. The S2 system shall support 32 threat level groups.

7. It shall also be possible to change the system threat level in response to an alarm event.

8. The current system threat level shall display in the title bar of the security application interface and on floorplans.

V. Location-based threat levels: The system administrator shall have the ability to define locations. This allows for threat levels to be assigned to individual locations.

5. Within each parent location, sub-locations can be created, and additional sub-locations can be created within each of these, and so on. This creates a location hierarchy.

W. Portals can be assigned, and threat levels applied, to any location within the hierarchy. Appropriate Use banner: The system administrator shall have the ability to enter text (such as an appropriate use statement) to be displayed on the login page.

X. Reports:

5. The S2 system shall be capable of producing a variety of predefined reports regarding software and security hardware configuration, event history, and the administration of people within the system. In addition, an easy to use query language shall be included to create ad hoc reports. The query language shall be documented in the online help system. Alternatively, it shall be possible to specify a query by use of point-and-click.

6. It shall also be possible to produce reports directly from the Network Controller based on data in archive files on FTP servers, network attached storage, or the built-in hard drive.

7. The S2 system shall support a graphic interface for interactively building custom reports from either historical or personnel data. These reports shall be savable for later reuse. Parameters can be inserted into reports to prompt for data input at report runtime. Report results can be printed, output to a PDF file or put into a spreadsheet.

8. It shall also be possible to group reports for assignment to custom user roles. Any reports not grouped and assigned to a custom user role shall not be viewable by that system user.

9. Report generation shall not affect the real-time operation of the system.

10. The specific reports provided shall include the following:

a. Configuration Reports

1) As Built: A graphical report that displays an image of each Application blade in a node and the specific resources (inputs, outputs, readers, etc.) configured for that blade. The network settings for the node shall also be included.

2) Cameras: Displays all camera configuration information including control address, IP port, and camera type.

3) Camera Presets: Displays configured presets for each camera in the system.

4) Elevators: Displays elevator configuration information including Node, Reader, and Floor to output mappings.

5) Floor Groups: Displays all configured floor groups for use in elevator control.

6) Holidays: Displays holiday specification information.

7) Portals: Displays portal definition information including reader, DSM input,

REX input, alarm outputs, and events.

8) Portal Groups: Displays a list of all defined portal groups.

9) Reader Groups: Displays defined groups of readers.

10) Remote Locksets: Available if the Remote Locksets feature is licensed for the system. Displays the following information for each remote lockset: name, IP address, synchronization status, serial number, last completed update time, firmware version, battery voltage, assigned remote lockset profile, and number of stored cardholders. The report can be sorted by any of the columns.

11) Resources: Displays all configured system resources including readers, inputs, outputs, elevators, and temperature points.

12) Threat Level Groups: Displays all configured threat level groups and the threat levels assigned to them. Threat Levels: Displays all configured threat levels including the description and color assignment.

b. History Reports

1) Access History: Displays access history based on an entered query. The system user can specify the query using either the keyboard or

point-and-click selection.

2) Custom Report: This provides the capability to create custom reports of historical data. A graphic interface provides the user with the ability to interactively create and save reports for later use. Parameters can be inserted into reports to prompt for data input at report runtime. Report results can be printed, output to a PDF file or put into a spreadsheet.

3) General Event History: Displays time, type of activity, and activity details for a variety of event types. The system user can select the specific event types for the report.

4) Portal Access Count: Display how many times users have used a portal.

5) Audit Trail: Displays an audit trail of system changes and the name of the system user that made the changes. It shall be possible to specify the dates and times covered in the report.

6) Duty Lop: Displays duty lop comments residing in the current security database, including archives. For each duty lop comment, the report shows the date and time the comment was entered, the person who entered the comment, the date and time of the lopped event associated with the comment, and the Activity Lop message followed by the specific comment text.

c. People Reports

1) Access Levels: Displays all access levels entered into the system including time specification, reader/reader group, and floor group.

2) Credential Audit: Lists existing credentials by their current status settings (such as Active, Damaged, Lost, or Not Used). Before running the report, users can filter the data to see only credentials with a particular status setting, or only credentials that were not used with a specific number of days from the date they were issued.

3) Current Users: Displays a list of all security system users currently logged in to the security system website.

4) Custom Report: This provides the capability to create custom reports of personnel data. A graphic interface provides the user with the ability to interactively create and save reports for later use. Parameters can be inserted into reports to prompt for data input at report runtime. Report results can be printed, output to a PDF file or put into a spreadsheet.

5) Occupancy: Displays a list of defined regions with the number of people currently occupying each region and the maximum number of occupants allowed, if a maximum has been specified.

6) Photo ID Gallery: Displays all the photo ID pictures in the system and the person's name.

7) Photo ID Requests: Displays all outstanding badge print requests and lists ID, name, badge layout, activation date, request date.

8) Portal Access: Lists people with access for a selected portal.

9) Roll Call: Allows you to select a defined Region from the drop-down and see a list of people currently in that region.

10) Roster: Displays every person entered the system and it lists name, ID photo, expiration date, username, and access level.

11) Time Specifications: Displays all defined time specifications currently in the system.

Y. Administration: The S2 system shall provide for the performance of system administration tasks from any network-connected computer with a browser. Most of the administrative, maintenance, and configuration utilities and functions shall require a S2 system user with at least a “Setup" user role. Information from the network administrator shall, in many cases, also be required. These administrative tasks shall include but not be limited to:

5. Generating reports:

a. The system shall be capable of producing a variety of predefined reports regarding software and security hardware configuration, event history, and the administration of people within the system.

b. Alternatively, the system shall support a graphic interface for interactively building custom reports from either historical or personnel data. These reports shall be savable for later reuse. Parameters can be inserted into reports to prompt for data input at report runtime. Report results can be printed, output to a pdf file or put into a spreadsheet.

c. It shall also be possible to group reports for assignment to custom user roles. Any reports not grouped and assigned to a custom user role shall not be viewable by that system user.

d. A system user holding “Administrator" permissions shall be able to view and create reports.

6. Database backups:

a. The system shall create database, or full system data backups, each night at 00:15 hours. These backups shall be stored in ROM and written to the drive on the disk-

based controller.

b. Backups shall also be written to network attached storage (NAS) or an FTP server if such storage has been configured in the system.

c. It shall also be possible for the system users to create such database backups at any time. Any database backups onboard the Network Controller may also be downloaded to off controller storage by the system user at any time.

7. System restore:

a. The system shall be able to restore its database, or the full system data, from a backup. Restoration of the system shall only be possible from a backup copy onboard the Network Controller. It shall, therefore, be possible to upload a copy of a database backup from any network attached storage.

b. It shall be possible to review backups by date and description and select the desired backup for upload to the Network Controller or restoration as the current system database.

8. Software updates:

a. Software updates, upgrades and patches shall be provided from time to time. The system shall be able to update its software from these .tgz files. Update of the application software shall only be possible from an update file onboard the Network Controller. It shall, therefore, be possible to upload a copy of the software update from any network attached storage or from any PC drive or desktop.

b. Software updates may involve the Network Controller only or may include updates for the node(s) also. The monitoring of the security system may be unavailable for several minutes during this process.

9. File cleanup: A utility shall be provided to assist in file cleanup. This utility will display for review and deletion all floorplan jpeg files, photo IDs, database backups, badge layouts, and software updates. File upload: The system shall support uploads of files for use in and with the system. Files which shall be up loadable include:

a. Floorplans in jpg format
b. Badge layouts
c. ID photos in jpg format
d. Database backups
e. Software license files
f. software updates
g. Threat level icons in jpg format
h. found files (.wav) for use in event alerts.

7. Setting system time, time zones, and time servers:

a. The system shall support the setting of time zones by selection off of a drop down pick list. Time zones shall be separately settable for the controller and for each node or MicroNode in the system. An extensive list of world-wide time zones shall be provided. Adjustments for daylight saving time (summertime) shall be automatic.

b. The system shall support the use of network time servers. Up to three time servers can be designated. Use of a network time server ensures that the Network Controller and its nodes will be regularly synchronized with the exact time used by all other network resources.

c. It shall also be possible to manually set the system date and time.

8. Changing passwords:

a. Person data maintained in the system may also contain a user name and password for logging on to the security application website as a system user. The system shall support the changing of administrator passwords. It shall be required to enter the password twice for verification purposes.

b. Administrators shall be able to specify a minimum number of characters that users must include in their login passwords.

c. Administrators shall be able to specify that users' login passwords must contain a combination of letters, numbers, and special characters.

d. Administrators shall be able to set a password expiration period in months (from 1 month to 12 months) for all passwords in the current partition. Whenever a user changes his or her password, it will remain in effect for the selected number of months.

e. It shall also be possible to integrate an LDAP server for single-user logon authentication. This will reference the LDAP-stored password for use by the system.

9. Issuing and revoking cards (credentials):

a. Access cards shall be assignable by the system user either by entering card data directly into the person record or by use of an enrollment reader. Access levels shall be assignable through the user interface by selection from a drop-down list.

b. Access cards shall be revocable at any time. A system user holding at least the Administer user role may perform this action. Revoked cards shall stop functioning immediately.

c. A system user holding at least the Administrator role may also disable an access card by changing its Active status to Clear, Damaged, Disabled, Forgotten, Lost, Not Returned, Not Validated, Returned, Stolen, or Suspended. The card will not function with any of these status settings (unless the setting has been customized, as described below). Running a Credential Audit report shall allow existing cards to be viewed by their current status settings. A system user holding at least the Administrator role may customize any of the following access card status settings: Clear, Damaged, Forgotten, Lost, Not Returned, Not Validated, Returned, Stolen, or Suspended. The user can change the name and/or description of the status setting and can specify that a card to which the setting is applied will continue to function.

d. A maximum number of active cards per person can be enabled for the system. Once a person has reached the system limit, a new card can be added for that person only if one of his or her active cards is revoked or disabled.

e. When “Enable credential profiles" is selected on the Network Controller page, it shall be possible to assign credential profiles to individual credentials to determine the number of days of non-use before they expire.

f. It shall be possible to set expiration dates for individual credentials in a person record.

g. It shall be possible to specify that any credential not used within a specific number of days from the date it was issued will be disabled automatically.

10. Enrolling new people: All person data entered into the system shall be held in the system database and shall be available only to system users holding at least the Administer user role. Person data can be added, deleted, and edited by such system users.
11. Creating Photo IDs: The system shall include an integrated photo ID function. It shall be possible:
    a. To design badge layouts.
    b. To upload badge layouts for badge printing.
    c. To capture ID photo images, print badges, and delete uploaded badge layouts.
    d. For the system user to manage all photo ID functions entirely from within the browser.
    e. To track the number of times a badge has been printed.
    f. To print multiple badges at once using the Badge Print Workflow.
    g. To enroll a person's card number manually or through a reader and save the new credential from the Badge Print Workflow.
12. Configuring network resources:
    a. DNS: The system shall support setting IP addresses for up to two domain named servers.
    b. Email settings: The system shall support the use of email notifications of alarm events. The system user must setup the email server IP address or DNS name and the email address of the Network Controller. A network administrator must setup the network mail server to relay email for the IP address of the Network Controller.
    c. File transfer protocol (FTP): The system shall support the use of an FTP Server for backups. Once configured, backups are automatically saved to the FTP server each night.
    d. NAV: The system shall support the use of network attached storage devices for backups. The network administrator must create a domain user account for the Network Controller and a password. The system user must configure the network attached storage in the system including the domain name, server IP address, share name, and the directory where the Network Controller may store data.
    e. Time Servers: The system shall support the use of network time servers. Up to three time servers can be designated. Use of a network time server ensures that the Network Controller and its nodes will be regularly synchronized with the exact time used by all other network resources. A system user holding “Setup" permissions shall be able to configure network resources.
13. LDAP: It shall be possible to configure an Active Directory Server with the S2 system.
    a. This shall provide single user-login capability.
    b. Password rules and authentication will be governed by the LDAP server.

2.3 ACCESS CONTROL NETWORK DOOR CONTROLLERS

A. Provide access control System master control processor, as shown on the project plans. The Master Control Processor is to provide access control processing, host functionality, and have a capacity for two doors, including reader, lock, and door status and request-to-exit device.

1. The processor shall be capable of several communication options including serial, dial-up or TCP/IP. It shall communicate with the server via TCP/IP and to peripherals via serial RS-485 protocol.
2. The processor shall have a 6MB memory configuration to allow a card storage capacity of 600,000 cards and to buffer a minimum of 50,000 events.
3. The processor shall have the capability of a total of 64 access control points via RS485 through expansion boards.
4. The door controller shall accept Wiegand output card readers and card formats up to 128 bits in length.
5. The Controller shall have the following functionality:
   a. Primary Port: 10/100 Ethernet Port
   b. Secondary Port: RR-485, RR-232, and Dial-UP.
   c. Two dedicated inputs: tamper and power monitor.
   d. Up to 8 active card formats per intelligent controller.
6. Manufacturer and Model: Based on system design and approval by SUNY New Paltz Telecommunications Representative Mercury EP-2500, EP1502, or S2 Netbox.

B. Provide a door controller(s) as shown on the project riser and plans. The door controller shall provide access control processing, host functionality and power for a single door, including reader, lock, door status and request-to-exit device.

1. The door controller shall accept Wiegand output card readers and card formats up to 128 bits in length.
2. The door controller shall provide a complete, fully featured access control hardware and firmware infrastructure for host-based access control software applications.
3. The door controller shall communicate with the System Control Processor (TCP) with hosted access control software using RS-485 serial communication.
4. The door controller shall provide full distributed processing of all access control functions. When not connected to SCP the unit shall locally process access requests based on facility code.
5. The Door Controller shall have the following functionality:
   a. Primary Port: RS-485.
   b. 1 reader port: Magnetic stripe, Wiegand, OD3P (Open Supervised Device Protocol) and proximity card readers.
   c. 2 programmable inputs for door contact and request to exit (REX).
   d. 1 dedicated tamper input.
   e. Two outputs; one dedicated for a strike (Form C, 1A @ 28Vdc) and one general purpose (Form C, 5A @ 28Vdc)
   f. Up to 8 facility codes may be active in each unit. Manufacturer and Model: Mercury MR-50/52 formatted for S2 or S2 ACM Blade.

2.4 POWER SUPPLIES

A. Access Control Power Supply

1. Product Description: Each door must be labeled and have a separate fused (1 AMP) power supply with:
2. 12VDC output
3. 115VAC input voltage

4. Filtered and electronically regulated Output.
5. Short circuit and regulated output
6. Automatic switch over to stand-by battery.
7. Built in charger for sealed lead acid or gel type batteries.
8. Provide Two (2) 7AH batteries.
9. Notification for loss of AC Power
10. Manufacturer and Model: Altronix AL1012 ULX8 with fused distribution or approved equal. Altronix PD8 Block or approved equal.

B. Access Control Output Board

1. Product Description:
2. 12-to-24-volt AC or DC operation
3. Eight (8) independently controlled outputs
4. Eight (8) fail safe and/or fail-safe power outputs.
5. Shall be mounted in same enclosure as the Altronix AL1012ULX8 Manufacturer and Model: Altronix PD8 Block or approved equal.

2.5 MISCELLANEOUS DEVICES

A. Magnetic Door Contacts
1. All doors with a card reader and electronic lock must have a Door Position Switch.
2. Refer to Door Hardware specification section 087100.

2.6 WIRE AND CABLE

A. Product Description: Power limited cable, copper conductor; 300 volts insulation rated (24 degrees C).

B. All CAT 6 cable shall be installed with a maximum distance of 300 feet. All CAT 6 cable and patch cables for security equipment shall be the color orange. All provided CAT 6 cable shall conform to the standards per section 271010. Provide test reports showing all wire tests were completed per section 271010 prior to system startup.

C. Refer to contract drawings for wire types and sizes. Provide wire per manufacture's recommendations if they are more stringent than what is shown on the contract drawings. Communications cable used to connect mercury access control panel (ACP) shall meet RS485 specification: 2 conductor separate ground and drain, Shielded.

D. All cables shall be in conduit.

E. Provide 2 conductor #16 AWG for cable lengths over 140 feet for exterior doors equipped with electronic locking device.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The security access system Vendor under direction of the Owner, shall program the entire security access system. This shall include entering all card holder information and the setting up of card holder access accounts. Programming shall also include setting up Owner specified auxiliary functions such as camera capture, time delays, etc. A meeting shall be held a minimum of four (4) weeks prior to final acceptance of the system to discuss Owner operations and programming requirements. Those in attendance shall be the Owner, Contractor, Vendor, and Owners Representative. The system shall be fully programmed prior to system acceptance testing and training. All connections to the S2 electronic equipment including CR, ACP, REX,

EL and the programming of this equipment must be performed by an S2 certified integrator.

B. The vendor shall coordinate all security system design and installation with Fac ties, Campus Telecom and all on site affected building trades (Finish Hardware, Electrical, etc.) for areas of responsibility and execution of related work.

C. Provide all necessary systems software, on site programming, systems integration and reporting to existing Campus security head-end at University Police: and all necessary testing and adjustments for a fully functional Card Access and/or Surveillance system.

D. Vendor to supply and install necessary low voltage and line voltage wiring systems with new electrical raceway and conduit system (as indicated in contract documents). Provide all required electrical rough-in and finish work as necessary to complete the systems wiring.

E. Vendor shall be responsible for verifying all conditions at the work site for completing installations, and shall verify all dimensions, existing conduit and required new raceways prior to the bid.

F. Vendor is responsible for layout and routing of conduit, and shall provide all additional raceways, junction boxes, cabinets, fixtures and other components to complete the system.

G. All work shall be completed to comply with NEC, NFPA and federal regulations and NYS State Building Code requirements. All equipment shall be UL Label. All electrical wiring and enclosures shall comply with NEC and Campus Standards ELECTRICAL. Vendor shall be responsible for appropriate wire size for all power supplies, and quantity of power suppliers for a fully functional system.

H. The Vendor shall deliver "As Built" schematic of installation and all Warranties to Fac ties: and complete all necessary training of designated Campus staff with use, operations, and maintenance of new installations.

3.2 FIELD QUALITY CONTROL

A. Testing

1. Preliminary Tests: Upon completion of the installation, the system shall be subjected to functional and operational performance tests including tests of each installed device. If deficiencies are found, corrections shall be made, and the system shall be retested to assure that it is functional. All testing shall be completed and documented by the Vendor. Final Acceptance: The system will be accepted only after satisfactory test of the entire system has been accomplished by a factory-trained distributor, in the presence of the Authority Having Jurisdiction, the Owner, and the Owners Representative. The Vendor shall notify the above witnesses, in writing, 72 hours prior to the commencement of testing.

2. The Vendor shall provide the on-site services of an authorized technical representative of the manufacturer to supervise all connections and fully test all components of the system installed. The Vendor, as directed by the Owner, shall conduct the acceptance test. The system shall be tested with the minimum required tests as follows:

   a. Verify the absence of unwanted voltages between circuit conductors and ground.
   b. Test all conductors for short circuits using an insulation-testing device.
   c. With each circuit pair, short circuit at the far end and measure the circuit resistance with an ohmmeter. Record the circuit resistance of each circuit on the record drawings.

d. Verify that the control panel is in normal condition.
e. Test each peripheral device for proper signal transmission.
f. Test entire system for proper operation and response at the control unit.
g. Test both primary and secondary power supplies.
h. Operation of each control, alarm, and monitoring point in the system and integration with other building systems.
¡. Simulate loss of communications between each controller and the host computer.
j. Report generation.
k. Provide testing and reporting of all network cables per specification 271010.
I. Provide testing of REX and DC.

3. The Vendor shall provide test sheets to document all tests. These will be signed by all present to verify testing is complete.

4. Testing: All Intrusion and Panic devices must be tested for functionality including communication to University Police Dispatch via the S2 System.

5. If any part of the test fails to meet the performance of the Contract Documents, the Vendor and or Electrician, at their own expense, shall retest the complete system with all applicable parties present.

6. Prior to the final testing, the Vendor shall perform tests on all systems to ensure proper operation.

3.3 DEMONSTRATION AND TRAINING

A. The Vendor shall provide a minimum of 20 hours of training. The sessions shall be broken up into an indefinite number dictated by the owner and shall consist of instruction and operation, maintenance and programming of all elements of the security access system.

B. Instruction shall be provided by a material or system manufacturer's certified representative familiar with the equipment and special operating requirements of the system provided and the Owner's operating procedures.

C. Instructions shall include classroom training as well as hands on training of all user level programming and system operation.

D. Instruction shall be made available on a schedule acceptable to the Owner and the availability of the operating personnel. Instructions shall be in two separate groupings with the last instruction time frame 30 days after the second grouping. This is to allow the operating personnel to familiarize themselves with the equipment and to receive.

E. follow-up training as required. Each training session shall be a minimum of 2 hour(s) long. The Vendor shall be responsible for providing sufficient training materials for all present at the training session, (minimum 15 personnel). Coordinate actual requirements with the Owner at time of training.

F. The Vendor shall be responsible for providing video recording of at least one of the training sessions, which will be submitted to the owner for future employee training. The video shall be submitted to the owner is a digital format via USB or DVD.

3.4 WARRANTY

A. Call back response time shall be 24 hours 7 days a week.

B. On-site response time shall be 24 hours 7 days a week.

END OF SECTION

SECTION 28 31 00 – FIRE DETECTION AND ALARM

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This Section covers fire alarm system design and installation, including all: initiating devices, notification appliances, controls, supervisory devices, including all components, wiring, and conduit.

B. Work covered by this section includes the furnishing of labor, equipment, and materials for installation of the fire alarm system as indicated on the drawings and specifications.

C. The Alarm System shall consist of all necessary hardware equipment and software programming to perform the following functions:

1. Fire alarm and detection operations.
2. Control and monitoring of elevators, fire suppression systems, and other equipment as indicated in the drawings and specifications.

D. Maintenance of fire alarm system under contract for specified warranty period.

1.2 RELATED REQUIREMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. Firestopping - Section 07 84 00

C. Door Hardware - Section 08 71 00

D. Sprinkler Systems - Section 21 13 00

E. Intertelecommunication and Mass Notification Systems - Section 27 51 17

1.3 REFERENCE STANDARDS

A. The system and all associated operations shall be in accordance with the following:

1. Building Code of New York State (2025)
2. Fire Code of New York State (2025)
3. NFPA 70 - National Electrical Code; 2023.
4. NFPA 72 - National Fire Alarm Code; 2022.
5. Mechanical Code of New York State (2025)
6. Local Jurisdictional Adopted Codes and Standards.
7. ICC A117.1 (2017) Accessibility Guidelines.

1.4 SYSTEM DESCRIPTION

A. General: Provide a complete, non-coded, addressable, microprocessor-based fire alarm system at Peregrine Dining Hall located at SUNY New Paltz in New Paltz, NY. The system shall include all wiring, raceways, pull boxes, terminal cabinets, outlet and mounting boxes, control equipment, alarm, and supervisory signal initiating devices, alarm notification appliances, and all other accessories and miscellaneous items required for a complete operating system even though each item is not specifically mentioned or described. System shall be compatible with the existing campus standard Notifier system. Provide Notifier Inspire. Provide all programing and graphics for the Head End Unit as required.

B. Existing Fire Alarm Equipment: Existing fire alarm equipment shall be maintained fully operational until the new equipment has been tested and accepted by the Owner. As new equipment is installed, it shall be tagged "NOT IN SERVICE" until the new equipment is accepted. All new equipment that has been placed in service, shall have tags removed immediately and tags stating “NOT IN SERVICE” shall be placed on existing equipment that is no longer in service until such equipment is removed from the building. The switchover from the existing equipment to the new equipment shall be sequenced as indicated on the drawings and in the specifications.

C. Equipment Removal: After acceptance of the new system by the Owner, all existing equipment (including conduit and wire) not connected to the new system shall be removed and all damaged surfaces shall be restored. The material shall be removed from the site and disposed of by the Contractor.

D. Completion of Work. Upon acceptance by the Owner all fire alarm equipment shall be immediately placed in service.

1.5 SYSTEM OPERATION

A. The system shall be a complete, supervised, addressable, fire alarm system conforming to NFPA 72, IBC, except as otherwise or additionally specified in this section.

B. Software: The fire alarm system shall allow for loading and editing instructions and operating sequences as necessary. The system shall be capable of storing, and downloading while the system is in operation, a second set of operating software resident in the control panels as backup in case primary operating software is corrupted. In addition, the system shall be capable of on-site programming to accommodate system expansion and facilitate changes in operation. All software operations shall be stored in a non-volatile programmable memory within the fire alarm control unit. Loss of primary and secondary power shall not erase the instructions stored in memory.

C. History Logs: The system shall provide a means to recall alarms and trouble conditions in chronological order for the purpose of recreating an event history. A separate alarm and trouble log shall be provided.

D. Wiring/Signal Transmission:

1. Transmission shall be as required addressable signal transmission, dedicated to fire alarm service only.
2. System connections for initiating (signaling) circuits and notification appliance circuits shall be Class A.

3. Circuit Supervision: Circuit faults shall be indicated by a trouble signal at the FACP. Provide a distinctive indicating audible tone and alphanumeric annunciation.

E. Required Functions: The following area required system functions and operating features:

1. Priority of Signals: Fire alarm events have highest priority. Subsequent alarm events are queued in the order received and do not affect existing alarm conditions. Priority Two, Supervisory and Trouble events have second-, third-, and fourth-level priority respectively. Signals of a higher-level priority take precedence over signals of lower priority even though the lower-priority condition occurred first. Annunciate all events regardless of priority or order received.
2. The activation of an addressable device does not prevent the receipt of signals from subsequent addressable device activations.
3. Transmission to Campus Security: Automatically route alarm, supervisory, and trouble signals to Campus Security.
4. Annunciation: Operation of alarm and supervisory initiating devices, and troubles shall be annunciated at the FACP and the remote annunciator, indicating the location and type of device.
5. General Alarm: A system general alarm shall include:
   a. Indication of alarm condition at the FACP and the annunciator.
   b. Identification of the device that is the source of the alarm at the FACP and the annunciator.
   c. Operation of speakers and visible notification devices throughout the building until silenced at FACP.
   d. Closing of smoke dampers universally on system alarm.
   e. Notifying Campus Security. Transmit a signal to campus police head-end unit located in the service building, through both the fiber network and wireless mesh radio frequency transceiver.
   f. Initiation of elevator recall in accordance with ASME/ANSI A17.1, when specified elevator lobby smoke detectors are activated.
6. Supervisory Operations: Upon activation of a supervisory device such as a tamper switch, the system shall operate as follows:
   a. Activate the system supervisory service audible signal and illuminate the LED at the control unit and the graphic annunciator.
   b. Pressing the Supervisory Acknowledge Key will silence the supervisory audible signal while maintaining the Supervisory LED "on" indicating off-normal condition.
   c. Record the event in the FACP historical log.
   d. Transmit a signal to campus police head-end unit located in the service building.
7. Restoring the condition shall cause the Supervisory LED restore system to normal.
8. Alarm Silencing: If the "Alarm Silence" button is pressed, all audible and visible alarm signals shall cease operation.
9. System Reset:
   a. The "System Reset" button shall be used to return the system to its normal state. Display messages shall provide operator assurance of the sequential steps ("IN PROGRESS", "RESET COMPLETED") as they occur. The system shall verify all circuits or devices are restored prior to resetting the system to avoid the potential for re-alarming the system. The display message shall indicate "ALARM PRESENT, SYSTEM RESET ABORTED."
   b. Should an alarm condition continue, the system will remain in an alarmed state.

10. Fire alarm system shall have ability to silence the alarm in the building from one main point.

F. Power Requirements

1. The control unit shall receive 120 VAC power via a dedicated circuit.
2. The system shall be provided with sufficient battery capacity to operate the entire system upon loss of normal 120 VAC power in a normal supervisory mode for a period of 24 hours with 15 minutes of alarm operation at the end of this period. The system shall automatically transfer to battery standby upon power failure. All battery charging and recharging operations shall be automatic.
3. All circuits requiring system-operating power shall be 24 VDC and shall be individually fused at the control unit.
4. The incoming power to the system shall be supervised so that any power failure will be indicated at the control unit. A green "power on" LED shall be displayed continuously at the user interface while incoming power is present.
5. The system batteries shall be supervised so that a low battery or a depleted battery condition, or disconnection of the battery shall be indicated at the control unit and displayed for the specific fault type.
6. The system shall support Notification Appliance Circuits (NAC) Lockout feature to prevent subsequent activation of NAC after a Depleted Battery condition occurs in order to make use of battery reserve for front panel annunciation and control.
7. The system shall support 100% of addressable devices in alarm or operated at the same time, under both primary (AC) and secondary (battery) power conditions.
8. Loss of primary power shall sound a trouble signal at the FACP. FACP shall indicate when the system is operating on an alternate power supply.

1.6 SUBMITTALS

A. Partial submittals will not be accepted and will be returned without review. Catalog data shall specifically show manufacturer's name, model, voltage, candela ratings of strobes, and catalog numbers for all equipment and components. Before any work is commenced, the Engineer and Owner’s Representative must approve the submittal. Manufacturer's data shall be annotated and provided for the following:

1. Tone Generators
2. Amplifiers
3. Storage Batteries
4. Battery Charger
5. Cabinets
6. Manual Pull Stations
7. Addressable Interface Devices
8. Terminal Cabinets/Assemblies
9. Addressable Relays
10. Remote Control Annunciator Panel
11. Speaker Units
12. Combination Speaker/Strobe Units
13. Visual Notification Appliance Strobes
14. Smoke Detectors
15. Heat Detectors
16. All Wiring Types and Sizes
17. Conduit and Raceway

18. Power Conditioner
19. Addressable Device Labels
20. Waterflow Switches
21. Tamper Switches
22. Duct Detectors and Remote LED indicators
23. Wireless Radio Mesh Transceiver

B. Shop Drawings: Submit full size shop drawings not smaller than 1:100 (1/8) accompanied by an electronic version compatible with AutoCAD version 2013 and pdf format. As a minimum, the shop drawing submittal shall include the following:

1. Point-to-point-wiring diagrams showing the points of connection and terminals used for all electrical field connections in the system, including all interconnections between the equipment or systems that are supervised or controlled by the system. Diagrams shall show all connections from field devices to the FACP and remote fire alarm control units, initiating circuits, switches, relays and terminals.
2. Drawings showing device locations, terminal cabinet locations, and all circuit layouts for all floors. All wiring sizes, types, and number in each conduit. Sizes and types of all conduit. All addressable devices shall have their digital addresses indicated on the shop drawing at the appropriate location. All visual notification appliances shall have their candela ratings indicated. All audible notification appliances shall have their wattage taps indicated.
3. Detailed drawings showing the layout of the Fire Alarm Control Panel including power supply, battery location, CPU, displays, modules, circuit boards, tone generators, amplifiers, NAC output devices including synchronization modules, terminal wiring scheme, add on terminals and any other functional component of the Fire Alarm Control Panel. All internal wiring details of the panel, including jumper positions must be shown.
4. Complete riser diagrams indicating the wiring sequence of all devices and their connections to the control equipment. Provide floor plans showing the location of all devices and equipment.
5. Detailed drawings of the remote control annunciator including power supply, terminal connections, circuit boards, modules, and communication scheme to the FACP. Annunciator drawings shall include a scale representation of the graphics layout and all components of the annunciator to be utilized by the end user.
6. A complete description of the system operation.
7. A complete list of device addresses and corresponding English language descriptors.

C. Calculations

1. Battery Calculations

   a. Provide complete battery calculations for both the alarm and supervisory power requirements including voice system. Ampere-hour requirements for each system component shall be submitted with the calculations.
   b. Calculate standby battery requirements for new batteries per manufacturer's installation requirements including all factors for aging, etc.
   c. Provide batteries with capacity rated at 150% of above calculated value.

2. Notification Circuit Calculations

   a. Provide calculations on each circuit to indicate that there is at least 25% spare power capacity for visual notification appliances, 25% spare capacity for audible notification appliances, and 25% spare capacity for notification device circuits. Note that this is spare power capacity and not spare programming capacity.

b. Provide calculations showing that no individual notification circuit is loaded beyond 80% of its full load capacity. Provide calculations that show that the total load for each remote power supply or FACP power supply is 80% or less of its full load capacity.

D. System Operation Matrix: The drawings shall show the sequence of fire alarm operations by providing an input/output matrix. The matrix shall distinguish between alarm, supervisory and trouble signals and incorporate the following information:

1. System Inputs

a. Manual fire alarm pull stations
b. Sprinkler waterflow switch
c. Tamper switch
d. Elevator Machine Room smoke detector
e. Elevator lobby smoke detectors for each elevator lobby
f. Duct smoke detectors
g. Area smoke detectors
h. Loss of power to elevator shunt trip circuit

2. System Outputs

a. Audible and visual notification appliances and associated signals for entire building and where required outputs for evacuation vs. relocation
b. Transmit “Fire Alarm” signal to monitoring station
c. Transmit “Supervisory” signal to monitoring station
d. Transmit “Trouble” signal to monitoring station
e. Recall of associated elevators to primary floor
f. Recall of associated elevators to alternate floor
g. Shunt trip of power to associated elevator equipment
h. Light elevator car fire service light
i. Flash elevator car fire service light
j. Release fire doors hold open devices
k. Shut down respective air handling units
l. Store event in system memory.
m. Display event on remote control fire alarm annunciator panel
n. Display specific device information and state on FACP
o. Activate audible directional egress devices

1.7 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer.

B. Installer Qualifications: Firm with minimum 10 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.

1. Authorized factory representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
2. Installer Personnel: At least 5 years of experience installing fire alarm systems.

3. Supervisor: NICET level III or IV certified fire alarm technician; furnish name and address.
4. Contract maintenance office located within 150 miles of project site.
5. Licensed in the State in which the Project is located as fire alarm installer.

C. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

D. Comply with NFPA 70.

E. Products: Each and all items of the Fire Alarm System shall be listed as a product of a single fire alarm system manufacturer under the appropriate category by Underwriters Laboratories, Inc. (UL), and shall bear the "UL" label.

1.8 EXTRA MATERIALS AND TOOLS

A. General: Provide spare parts of same manufacturer and model as those installed; deliver in original packaging, labeled in same manner as in operating and maintenance data.

1. Break Rods for Manual Stations: Furnish quantity equal to 15 percent of the number of manual stations installed; minimum of 6 rods.
2. Strobe Units: Furnish quantity equal to 10 percent of the number of units installed, but not less than one.
3. Smoke Sensors, Fire Sensors, and Flame Sensors: Furnish quantity equal to 10 percent of the number of units of each type installed but not less than one of each type.
4. Sensor Bases: Furnish quantity equal to 2 percent of the number of units of each type installed but not less than one of each type.

1.9 WARRANTY

A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of three (3) years from the date of acceptance of the entire installation by the Owner. Final Acceptance includes, but is not limited to, successful final acceptance testing, the receipt of as-built drawings and operation and maintenance manuals. On-site service during the warranty and guarantee period shall be provided within 8 hours after notification. All repairs shall be completed within forty-eight (48) hours after notification.

B. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. This product is Proprietary as approved by SUCF as a sole source exempt material to meet the college requirements. No product substitutions will be considered.

1. Manufacturers: The equipment and service described in this specification are those supplied and supported by Honeywell Notifier and represent the base bid for the equipment. Fire Alarm system shall be purchased from a Notifier Authorized vender for the area of installation. Notifier Inspire System. www.securityandfire.honeywell.com/notifier/en-us/browseallcategories/control-panel/notifier-inspire-series/#sle
2. The Manufacturer shall be a nationally recognized company specializing in fire alarm and detection systems. This organization shall employ factory trained and NICET certified technicians, and shall maintain a service organization within 150 miles of this project location. The Manufacturer and service organization shall have a minimum of 10 years experience in the fire protective signaling systems industry.
3. Initiating Devices, and Notification Appliances:
    a. Same manufacturer as control units.
    b. Provide all initiating devices and notification appliances made by the same manufacturer.

2.2 FIRE ALARM SYSTEM

A. Fire Alarm System: Provide a new Notifier microprocessor based, addressable, and intelligent, Fire Alarm System for the building including: all new audible alarms, visual alarms, intelligent smoke detectors, addressable detection devices, addressable manual stations, wire, valve supervisory switches, flow switches, and pressure switches. System shall include any miscellaneous hardware as required for proper system operation. System shall utilize digital transmission for data information between devices, monitor, control devices, and fire alarm panel. Provide programing as required for connection to campus system. Fire Alarm system shall be purchased from a Notifier Authorized vender for the area of installation.

1. Provide all components necessary, regardless of whether shown in the contract documents or not.
2. Protected Premises: Entire Building.
3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
    a. ADA Standards for Accessible Design.
    b. The requirements of the State Fire Marshal.
    c. The requirements of the local authority having jurisdiction.
    d. Applicable local codes.
    e. The contract documents (drawings and specifications).
    f. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on submittals.
4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
5. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
6. Program notification zones as directed by Owner.
7. System shall close doors normally held open by magnetic door holders.
8. Contractor shall hire Notifier authorized vender, for all programming of the system, re-programming of the campus fire alarm system, and all required testing, training, etc.

B. Supervising Stations and Fire Department Connections:

1. Public Fire Department Notification: By on-premises supervising station.
2. On-Premises Supervising Station: Campus Security

C. Circuits

1. Initiating Device Circuits (IDC): Class A.
2. Signaling Line Circuits (SLC): Class A.
3. Notification Appliance Circuits (NAC): Class A.

D. Power Sources

1. Primary: Dedicated branch circuits of the facility power distribution system.
2. Secondary: Storage batteries.
3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.

E. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.

F. Mass Notification:

1. Provide an audio input module (IP based) for system interface connection with campus standard mass notification system. fire alarm system speakers shall be used as mass notification voice annunciator devices, and fire alarm strobes shall be used for visible notification.
2. Provide all programming and equipment modifications to FACP and campus mass notification system with modules, relays, power supplies, and other components necessary for a complete and operational system.
3. Mass notification systems integrated with the building fire emergency voice/alarm communication system, must follow pathway survivability level 2, that requires 2-hour fire rated circuit integrity (CI) cable for notification appliances, as per NFPA 72 24.3.5.4.1.
4. The local building mass notification system shall have the ability to override the fire alarm system with live voice or manual activation of a high priority message. Messages from the mass notification system shall take priority over fire alarm messages and signals. Messages and signal priority from the mass notification system and fire alarm system shall be as listed (from highest priority to lowest priority):

   a. In building microphone/live voice messages
   b. Remote microphone/live voice messages (at campus security)
   c. Fire alarm messages and signals
   d. Automated voice messages (in building)
   e. Automated voice messages (remote/central)

5. If the fire alarm system is in the alarm mode and a recorded message, or voice message or the audible signals are sounding, and the mass notification system is actuated, it shall cause the de-activation of all fire alarm-initiated audible and visible notification appliances, unless they are used for mass notification use. After the mass notification system relinquishes control, the following will occur: Without an active fire alarm signal, fire alarm system shall automatically restore to normal operation, With an active fire alarm signal, the fire alarm system shall operate based on the emergency response plan. Unless determined otherwise the fire alarm system should always be automatically returned to normal functionality. Deactivation of the fire alarm audible and visual notification signals shall

cause an individually identified supervisory signal to be initiated at the building fire alarm control panel. The fire alarm deactivation function shall be permitted to occur only when both the fire alarm system is in an alarm condition and the voice message is initiated by the mass notification system. When the fire alarm system is overridden, then all other features of the fire alarm system shall remain unaffected.

2.3 FIRE SAFETY INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:

1. Sprinkler water control valves (non-latching).
2. Carbon Monoxide detection (latching).
3. Elevator shunt trip control power monitoring.
4. Mass notification priority (non-latching).
5. Duct smoke detectors.
6. Smoke detection.
7. Heat detection.
8. Manual pulls stations.

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:

1. Sprinkler water flow.
2. Kitchen hood suppression activation; also disconnect fuel/power sources from cooking equipment.

C. Elevators:

1. Elevator lobby: Elevator recall for fire fighters' service.
2. Elevator lobby detectors.
3. Elevator controller location smoke detector.
4. Elevator hoistway detectors.

D. HVAC

1. Duct smoke detectors: close dampers, shut down air handler units with return air systems greater than 2,000 CFM, upon detection of smoke.

E. Doors:

1. Magnetic door holders: release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor.

2.4 COMPONENTS

A. General

1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.

2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
3. Existing fire alarm devices removed shall be cataloged and turned over to the owner with receipt.

B. Fire Alarm Control Units, Initiating Devices, and Notification Appliances: addressable type; listed by Underwriters Laboratories as suitable for the purpose intended.

1. Shall comply with UL 864, "Control Units for Fire-Protective Signaling Systems".

C. Fire Alarm Control Panel:

1. The fire alarm control panel or panels and all system devices (Speaker-strobes, strobes, pull stations, smoke and heat detectors, etc. shall be Notifier INSPIRE Series by Honeywell. All under one label "UL listed and approved" for the use of fire alarm systems in this area of the United States of America. The operating controls shall be located behind locked door with viewing window. All control modules shall be labeled, and all zone locations shall be identified.
2. SLCs: Small panel enclosure, up to three SLCs.
   a. Supporting up to 954 devices (477 detectors and 477 modules) configurable for Class B or Class A with signaling loop modules.
   b. Configured with no voice and no networking capability.
   c. Provide standard, preconfigured small black enclosure.
3. FACU User-Interface:
   a. Provide high-definition 10-inch (254 mm) 1024 X 600 color touchscreen display.
   b. Include audible and visible feedback with adjustable brightness solid-state LCD.
   c. Include graphical QWERTY-style keypad on color, touchscreen display when alfa-numeric input is required.
   d. Provide capability to scroll events by type using touchscreen (e.g., fire alarm, supervisory alarm, and trouble).
   e. Permit uploading of custom background image.
   f. Include ability to display up to 3,000 events in order of priority and time of occurrence.
   g. Provide event counters to indicate total number of events by type.
   h. Passwords and Users:
      1) Support five access levels (e.g., system operator, building maintenance user, technician user, admin user, master user) and up to 50 usernames and passwords.
      2) Each role level access has default customizable permissions.
      3) Only master password allows password change.
   i. Custom Actions
      1) Messages: Provide means of entering up to 100 custom action messages, up to 160 characters each, with ability to assign any of 100 messages to any point.
      2) Button: Support up to 32 programmable custom action buttons on LCD touchscreen display used to enable/disable or control outputs without use of additional hardware.
   j. Support up to ten remote LCD displays. See "Remote LCD Display" below.
4. Provide FACU based on licensing model to allow for future expansion.

a. Support licensable features to expand logical operations and features for FACU and display functionality.
b. Support SLC expansion from one up to ten, using same FACU central processing unit and without need to be replaced or upgraded.

5. Online, Offline, or Remote Programming:

a. Provide means to program panel either through offline software utility program nonlocal to panel or connected online remotely via secured gateway.
b. Support upload/download of programmed database to personal computer (PC) or cloud storage.

6. History Events:

a. Support software maintained history file for last 10,000 events; each with time and date stamp with ability to scroll through stored events.
b. Include alarms, troubles, operator actions, and programming entries.
c. Provide ability to filter and sort history by event type, date, or point range.

7. Service Mode

a. Provide ability to remotely access FACU for programming, testing, and control.
b. Include customizable time-out feature.
c. Trouble condition is displayed while in this mode.

8. Support AV magnet test with compatible AV appliances. Provide ability to test individual AV appliances on NAC by applying magnet to appliance momentarily; test does not activate entire circuit, minimizing disruptions during testing and inspection.
9. Support self-testing detector capability.
10. Logical Operators:

a. Support logical functions, including at minimum: AND (ALL), OR (ANY), NOT, ONLY1, COUNT (one-nine), and TIMERS.
b. Inputs for Operators: Time of day, addressable devices, software points, and trouble codes.
c. Capable of differentiating operator inputs by specific device status (i.e., fire alarm, prealarm, nonalarm, disable, supervisory, and security).

11. Virtual Points

a. The panel will support the creation of up to 511 virtual points capable of activating user-defined signals on the fire alarm display including fire alarm, supervisory, trouble, and security.
b. Each virtual point will be capable of:
   1) Incorporating unique 40-character custom label.
   2) Activating unique software zones and panel outputs.
   3) Selectively reported to the central station as unique point.
   4) Activation by Software Zones or Logical Zones.

12. SLC Device Sub-addressing

a. Combination detectors will support operations for each sensing technology independently.
   1) Active sensing technology is clearly visible on each user interface along with the associated panel response (Alarm, Supervisory, etc)
   2) Single combination detector allows for cross-zoning its separate sensing elements for releasing and similar applications.

3) A sensing technology will be capable of being turned off or ignored via system programming.

13. Panel shall have an interfact module for remote site monitoring. Via both fiber and wireless mesh radio frequency, the alarm , supervisory and trouble signals transmits to the Campus monitoring station.
14. Support up to 80 addressable panel annunciators. See "Addressable Panel Annunciators" below.
15. FACU Main Power Supply:
    a. Provide addressable main power supply with universal input to accept either 120/240 VAC, 60 Hz, supplying all necessary power for FACU.
    b. Include minimum four integral and programmable NACs.
        1) Provide onboard patterns, zone coding, and synchronization (System Sensor, Wheelock, and Gentex).
    c. Supply power distribution of each addressable main power supply that can be customizable to provide power for system, NAC, supporting circuits, auxiliary, and battery charging.
    d. Power supply supports up to 210 AH batteries.
16. Basis of Design Products:
    a. Notifier INSPIRE Series Model CPU-N16LD (N16x) expandable to 10 SLCs with 10-inch (254 mm) touchscreen display, and power supply with four NACs premounted on chassis compatible with CAB-5 enclosure.
    b. Notifier Model PMB-AUX; up to two additional power supplies, one charging batteries, each supporting up to four NACs each.
    c. Notifier CAB-5 Series enclosure with door for mounting; include required dress plates and finish trims.
    d. Notifier Model SLM-318; signal loop module.

D. Emergency Voice/Alarm Communications System (EVACS) Panel:

1. Provide system listed and labeled as complying with UL 864 and UL 2572.
    a. Provide the following additional agency listings and approval requirements:
        1) UL 464 (Audible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories).
        2) UL 1481 (Power Supplies for Fire-Protective Signaling Systems).
        3) UL 1638 (Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories).
        4) UL 1711 (Amplifiers for Fire Protective Signaling Systems).
        5) UL 1971 (Signaling Devices for the Deaf and Hard of Hearing).
        6) UL 60950-1 (Information Technology Equipment - Part 1: General Requirements).
2. Provide digital voice command center located with FACU and containing equipment required for audio control, signaling and supervisory functions. This includes speaker zone indication and control, EVACS controller, and master microphone
3. Provide EVACS Controller which is field programmable without requiring return of components to manufacturer and without requiring use of external computers or other programming equipment.
    a. Capable of supporting up to eight channels of simultaneous audio; each identified evacuation zone to allow broadcast of automatic audio or manual paging independent of other evacuation zones.

b. Provide factory recorded "library" of voice messages and tones in standard .WAV file format, which may be edited and saved on PCs running current Windows operating system.
c. Capable of control and supervision of 32 distributed digital amplifiers or 16 bulk digital distribution boards.
d. Provide communication channel which allows connection to digital amplifiers via manufacturer-approved multi-mode fiber optic media. Communications loop to be considered part of fire alarm system network and meet specified requirements for wiring methods and pathway survivability.
e. Include auxiliary input for external 1 Vrms audio source (e.g., music, and paging), configurable to mute during emergency events and power loss.

4. Provide switch points of command as follows, unless otherwise approved by Engineer and AHJ:

a. All-Call: Provides manual paging for all zones simultaneously.
b. Total Evacuation: Provides complete building-wide activation of audio and visual evacuation signals; restore on switch deactivation, signal silence, or system reset command.
c. Provide minimum of two switch points of manual controls per evacuation zone for manual paging and/or manual evacuation.
1) Manual Evacuation: Activate audio and visual evacuation signals on selected zone. Restore on switch deactivation, signal silence, or system reset command.
2) Manual Paging: Where active evacuation zone is selected, pause evacuation signal for manual page. Resume evacuation signal upon completion of paging function unless silence or reset command has been initiated.
d. In addition to required emergency messaging, provide switch points of command for minimum of three prerecorded messages for nonemergency all-call notifications including "event has cleared", "testing of system", and "clear from testing of system".
e. Provide minimum of six switch points of command for speaker bypass, visual bypass, elevator recall bypass, door control bypass, HVAC bypass, and auxiliary bypass.

5. Audio Transponders:

a. Audio hardware, including amplifiers, speaker circuit interfaces, power supplies, supervision hardware, cabinets, and battery backup systems may be configured to support multiple notification zones and packaged as audio transponders.
b. Transponders to be considered system control equipment and located, installed, and interfaced accordingly.
c. Components mounted in transponders to be listed and approved for installed configuration.
d. Provide maximum speaker circuit lengths with minimum signal loss for both current scope and future expansion consideration; maximum signal loss of minus 3 dB per speaker circuit, utilizing 70 Vrms audio for speaker circuits.

6. Distributed Digital Audio Amplifiers:

a. Interface with EVACS controller via individual address to allow for dedicated communication of audio, activation, and fault status.
b. Provide minimum quantity of two integrated speaker circuits per amplifier, each with unique system sub-address to allow for individual activation, control, and fault

supervision. Systems that utilize addressable control or relay modules to provide speaker circuits are not permitted.

c. Provide capability to charge or supervise batteries and allow for inherent ground fault detection.

d. Provide capability for local mode alarm trigger for local activation and broadcast of evacuation tone on integrated speaker circuits in event of communication loss with system control hardware.

e. Include auxiliary input for external 1 Vrms audio source (e.g., music, and paging), configurable to mute during emergency events and power loss.

f. Provide capability to communicate detailed status of faults and conditions affecting operation of amplifiers and individual circuits. Systems that combine audio and communication into single points via addressable modules or other hardware are not permitted.

g. Provide dedicated backup amplifier board for each primary amplifier.

7. Basis of Design Products:

a. Notifier Model DVC-EM; digital multi-channel voice evacuation (EVACS) system integrated with FACU.

1) Notifier Model DVC-KDB; voice control keypad for DVC-EM with status indicators and 24 user-programmable buttons.

2) Fiber optic communication modules:

a) Notifier Model DS-FM; multi-mode fiber optic module for digital audio communications.

b. Distributed Digital Audio Amplifiers:

1) Notifier Model DAA2-5070; 50 W, 70 Vrms amplifier with four Class B or two Class A speaker circuits

2) Fiber Optic Communication Modules:

a) Notifier Model DS-FM; multi-mode fiber optic module for digital audio communications.

3) Backup Amplifier/Dual Channel Boards:

a) Notifier Model BDA-70V; 70 Vrms backup amplifier card.

E. Remote LCD Annunciators:

1. Provide two (2) Remote LCD Annunciator with same "look and feel" as the FACP operator interface. The Remote LCD Annunciator shall use the same Primary Acknowledge, Silence, and Reset Keys, Status LEDs and LCD Display as the FACP.
2. Comply with UL 864.
3. Capable of mimicking display of either FACU or network control display, based on connection or only information per specific zones.
4. Provide plug-in terminal blocks for wiring connections.
5. Provide 5-inch (127 mm) capacitive full color touchscreen LCD annunciator that displays all system events.
6. Block Acknowledge: Support block acknowledge for trouble and disable conditions.
7. Provide programmer key switch for user authentication, providing ability to enable control inputs for acknowledge, silence, reset, and drill.
8. Provide configurable control buttons that are operational only when keyswitch is unlocked.
9. Provide six programmable buttons, each with descriptor/label, status indicator and configurable action (on/off, disable/enable).
10. Capable of being field programmed using PC configuration software.

a. Provide standard USB-C connection for software interface.

11. Provide microphone where indicated on drawings.
12. Basis of Design Products:
    a. Notifier Model RLD network control annunciator, 5-inch (127 mm) color touch screen display; mounts in CAB-5 series cabinet.

F. Emergency Power Supply

1. General: Components include battery, charger, and an automatic transfer switch.
2. Battery: Sealed lead-acid or nickel cadmium type. Provide sufficient capacity to operate the complete alarm system in normal or supervisory (non-alarm) mode for a period of 24 hours. Following this period of operation on battery power, the battery shall have sufficient capacity to operate all components of the system, including all alarm indicating devices in alarm of supervisory mode for a period of 15 minutes.

G. Initiating Devices:

1. Manual Pull Stations: Notifier Model NBG-12LX or approved equal. Addressable, Dual-action type, red metal, and finished in red with molded, raised-letter operating instructions of contrasting color. Station shall mechanically latch upon operation and remain so until manually reset by opening with a key common with the control units.

H. Smoke Detectors (Notifier Model FSP-951T or approved equal):

1. General: Comply with UL 268, "Smoke Detectors for Fire Protective Signaling Systems." Include the following features:
    a. Factory Nameplate: Serial number and type identification.
    b. Operating Voltage: 24 VDC, nominal.
    c. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore normal operation.
    d. Plug-In Arrangement: Sensor and associated electronic components are mounted in a module that connects to a fixed base with a twist-locking plug connection. Base shall provide break-off plastic tab that can be removed to engage the head/base locking mechanism. No special tools shall be required to remove head once it has been locked. Removal of the detector head shall interrupt the supervisory circuit of the fire alarm detection loop and cause a trouble signal at the control unit.
    e. Each sensor base shall contain an LED that will flash each time it is scanned by the Control Unit (once every 4 seconds). In alarm condition, the sensor base LED shall be on steady.
    f. Each sensor base shall contain a magnetically actuated test switch to provide for easy alarm testing at the sensor location.
    g. Each sensor shall be scanned by the Control Unit for its type identification to prevent inadvertent substitution of another sensor type. Upon detection of a "wrong device", the control unit shall operate with the installed device at the default alarm settings for that sensor; 2.5% obscuration for photoelectric sensor, 135-deg F and 15-deg F rate-of-rise for the heat sensor, but shall indicate a "Wrong Device" trouble condition.
    h. The sensor's electronics shall be immune from false alarms caused by EMI and RFI.
    i. Addressability: Sensors include a communication transmitter and receiver in the mounting base having a unique identification and capability for status reporting to the FACP. Sensor address shall be located in base to eliminate false addressing when replacing sensors.
    j. Removal of the sensor head for cleaning shall not require the setting of addresses.

k. Addressable programmable Sounder bases: Provide proper sounder base sequence. Sounder base shall be silenceable upon alarm silence activation at the Fire alarm control panel.

2. Smoke Sensors: Shall be of the photoelectric type. Where acceptable per manufacturer specifications, ionization type sensors may be used.

I. Heat Sensors

1. Thermal Sensor: (Notifier Model FST-951-SELFT) Combination fixed-temperature and rate-of-rise unit with plug-in base and alarm indication lamp; 135-deg F fixed-temperature setting except as indicated.
2. Thermal sensor shall be of the epoxy encapsulated electronic design. It shall be thermistor-based, rate-compensated, self-restoring and shall not be affected by thermal lag.
3. Sensor fixed temperature sensing shall be independent of rate-of-rise sensing and programmable to operate at 135-deg F or 155-deg F. Sensor rate-of-rise temperature detection shall be selectable at the FACP for either 15-deg F or 20-deg F per minute.
4. Sensor shall have the capability to be programmed as a utility monitoring device to monitor for temperature extremes in the range from 32-deg F to 155-deg F.

J. Combination and Multi-Criteria Detectors (Notifier Model FCO-951 or approved equal):

1. Provide with same requirements as standard heat detectors list above.
2. Provide with an advanced carbon monoxide sensor and associated daughterboard. The sensor/daughterboard module shall be field replaceable.

K. Audible Base for CO and Smoke Detectors (Notifier Model B200S-WH or approved equal):

1. Provide distinct signal for fire alarm vs CO activation.

L. Duct Smoke Detectors:

1. Listed and labeled as complying with UL 268A.
2. Sampling Tubes: Select as required for installation in duct to be monitored.
3. Remote Test Stations: Provide remote test station for each duct smoke detector unless explicitly indicated as not required. Unless otherwise indicated, use remote test stations only in clean, dry, indoor, nonhazardous locations.
4. Basis of Design:

a. Notifier Model DNR duct smoke detector housing, indoor rated.
1) Notifier Model FSP-951R addressable smoke detector, indoor rated, photoelectric, remote test capable.
2) Notifier DST Series sampling tube of appropriate length.

b. Notifier Model RTS151KEY remote test station for addressable detectors; allows for detector test (via external magnet application) and key rest; provide LED indication of alarm condition.

M. Notification Appliances

1. Notification Appliances - General Requirements:

a. Provide signaling devices listed for fire-protective service and intended operating mode (public or private); suitable for connection to FACU notification NAC.

b. Provide addressable control modules as indicated or as required for selective control of notification appliances.
c. Provide notification appliances and associated accessories suitable for intended application and location to be installed. Use notification appliances only according to listed mounting (i.e., ceiling or wall mounted).
d. Surface-Mounted Notification Appliances: Provide manufacturer's accessory surface mount backboxes or suitable outlet/device box.
e. Notification Appliances for Outdoor and Damp/Wet Locations: Weatherproof, suitable for outdoor use; provide manufacturer's accessory backboxes and enclosures in accordance with product listing.
f. Notification Appliance Derating: Account for device derating adjustments in accordance with listing where applicable, including but not limited to the following.
   1) Where accessory protective guards, and enclosures are utilized.
   2) Where required by field conditions (e.g., ambient temperature).
g. Notification Appliances Colors:
   1) See mounting configuration indicated by floor plan drawing symbols.
   2) Wall-Mounted: White.
   3) Ceiling-Mounted: White.
h. Notification appliances must be labeled with “ALERT” only on them.

2. Visible Notification Appliances:

   a. Public Mode Operation: Listed and labeled as complying with UL 1971.
   b. Strobes: Clear or nominal white lens with flash rate of 1 Hz unless otherwise indicated or required; xenon light source with maximum pulse duration of 0.2 seconds; candela rating as indicated.

3. Audible Notification Appliances:

   a. Listed and labeled as complying with UL 464.
   b. Rated Sound Pressure Level: As required to achieve design sound pressure levels, but not less than 75 dB(A) at 10 feet (3.1 m) for public mode operation or 45 dB(A) at 10 feet (3.1 m) for private mode operation in accordance with UL 464.

4. Speakers for Emergency Voice/Alarm Communications Systems (EVACS)

   a. Listed and labeled as complying with UL 1480.
   b. Rated Sound Pressure Level: As required to achieve design sound pressure levels, but not less than 75 dB(A) at 10 feet (3.1 m) in accordance with UL 1480.
   c. Frequency Range: 400 to 4,000 Hz minimum in accordance with UL 1480; listed for producing 520 Hz low frequency alarm signal for sleeping areas in accordance with NFPA 72.
   d. Speaker Voltage: Field-selectable (25 Vrms, 70.7 Vrms); matched to audio distribution circuit.
   e. Furnished with minimum of four field-selectable power taps.

5. Combination Notification Appliances: Comply with respective requirements for each signaling method.
6. Basis of Design Products:

   a. Strobes:
      1) Notifier Model SWLED strobe, indoor rated, wall-mounted, white, selectable candela output (15, 30, 75, 95, 110, 135, 185 at 24 VDC nominal).
      2) Notifier Model SGWLED strobe, compact, indoor rated, wall-mounted, white, selectable candela output (15, 30, 75, 95, 110, 135, 185 at 24 VDC nominal).

3) Notifier Model SWK strobe, weatherproof (includes backbox), wall-mounted, white, selectable candela output (15, 15/75, 30, 75, 95, 110, 115 at 24 VDC nominal).
4) Notifier Model SCWLED strobe, indoor rated, ceiling-mounted, white, selectable candela output (15, 30, 75, 95, 115, 150, 177 at 24 VDC nominal).
5) Notifier Model SCWKLED strobe, weatherproof (includes backbox), ceiling-mounted, white, selectable candela output (15, 15/75, 30, 75, 95, 110, 115 at 24 VDC nominal).
6) Notifier Model SCWHKLED-P strobe, plain, weatherproof (includes backbox), wall-mounted, white, selectable candela output (135, 150, 177, 185 at 24 VDC nominal).

b. Speakers:
1) Notifier Model SPWL speaker, indoor rated, wall-mounted, white.
2) Notifier Model SPWK speaker, weatherproof (includes backbox), wall-mounted, white.
3) Notifier Model SPCW8 speaker, dual-voltage, indoor rated, ceiling-mounted, white.
4) Notifier Model SPCWK speaker, weatherproof (includes backbox), ceiling-mounted, white.

c. Speaker/Strobes:
1) Notifier Model SPSWL speaker/strobe, indoor rated, wall-mounted, white, selectable candela output (15, 30, 75, 95, 110, 135, 185 at 24 VDC nominal).
2) Notifier Model SPSWK speaker/strobe, weatherproof (includes backbox), wall-mounted, white, selectable candela output (15, 15/75, 30, 75, 95, 110, 115 at 24 VDC nominal).
3) Notifier Model SPSCWL speaker/strobe, indoor rated, ceiling-mounted, white, selectable candela output (15, 30, 75, 95, 115, 150, 177 at 24 VDC nominal).
4) Notifier Model SPSCWK speaker/strobe, weatherproof (includes backbox), ceiling-mounted, white, selectable candela output (15, 15/75, 30, 50, 75, 95, 110, 115 at 24 VDC nominal).

N. Addressable Circuit Interface Modules

1. Addressable Circuit Interface Modules: Arrange to monitor one or more system components that are not otherwise equipped for addressable communication. Modules shall be used for monitoring of waterflow, valve tamper, non-addressable devices, and for control of evacuation indicating appliances and AHU systems.
2. Addressable Circuit Interface Modules will be capable of mounting in a standard electric outlet box. Modules will include cover plates to allow surface or flush mounting. Modules will receive their operating power from the signaling line or a separate two wire pair running from an appropriate power supply as required.
3. There shall be two types of modules:

a. Type 1: Monitor Cicuit Interface Module:
1) For conventional 2-wire smoke detector and/or contact device monitoring with Class B or Class A wiring supervision. The supervision of the zone wiring will be Class B. This module will communicate status (normal, alarm, trouble) to the FACP.
2) For conventional 4-wire smoke detector with Class B wiring supervision. The module will provide detector reset capability and over-current power protection for the 4-wire detector. This module will communicate status (normal, alarm, trouble) to the FACP.

b. Type 2: Line Powered Monitor Circuit Interface Module
   1) This type of module is an individually addressable module that has both its power and its communications supplied by the two wire multiplexing signaling line circuit. It provides location specific addressability to an initiating device by monitoring normally open dry contacts. This module shall communicate four zone status conditions (normal, alarm, current limited, trouble) to the FACP.

4. All Circuit Interface Module shall be supervised and uniquely identified by the control unit. Module identification shall be transmitted to the control unit for processing according to the program instructions. Modules shall have an on-board LED to provide an indication that the module is powered and communicating with the FACP. The LEDs shall provide a troubleshooting aid since the LED blinks on poll whenever the peripheral is powered and communicating.
5. Provide elevator control modules for primary recall, alternate recall, and fireman's hat.
6. Basis of Design Products

   a. Addressable Monitor Modules
      1) Notifier Model FMM-1 addressable monitor module; single monitoring point, supervises one Class A or Class B circuit of conventional dry-contact input devices; uses single module address on SLC; mounts to nominal 4-inch (102 mm) square or 2-gang box, includes white finish cover.
      2) Notifier Model FDM-1 addressable monitor module; two monitoring points, supervises two Class B circuits of dry-contact input devices; uses two module addresses on SLC; mounts to nominal 4-inch (102 mm) square or 2-gang box, includes white finish cover.
   b. Addressable Control Modules: Notifier Model FCM-1 addressable control module; single supervised control output, Class A or Class B, suitable for controlling 24 VDC NAC and speakers up to 70.7 Vrms; requires separate power; uses single module address on SLC; mounts to nominal 4-inch (102 mm) square or 2-gang box, includes white finish cover.
   c. Addressable Relay Modules: Notifier Model FRM-1 addressable relay module; two Form C dry contacts that switch together; uses single module address on SLC; mounts to nominal 4-inch (102 mm) square or 2-gang box, includes white finish cover.
   d. Addressable Signaling Line Circuit (SLC) Isolating Modules:
      1) Notifier Model ISO-X addressable signaling loop circuit (SLC) isolating module; does not use any module addresses on SLC; mounts to nominal 4-inch (102 mm) square or 2-gang box, includes white finish cover.
      2) Notifier Model ISO-6 addressable signaling loop circuit (SLC) isolating module; does not use any module addresses on SLC; mounts on CHS-6 chassis within enclosure.
   e. Accessories: Notifier Model PR-1 power isolation relay for loads exceeding relay module contact ratings; operating voltage of 18-35 VDC, 18-35 VAC, or 120 VAC; LED visible indication of relay coil energization.

O. Electromagnetic Door Holders

1. Description: Units shall be listed to UL 228. Units are equipped for wall or floor mounting as indicated and are complete with matching door plate. Rated 24 vac/dc.
2. Provide power module(s) as necessary.
3. Material and Finish: Match door hardware.

P. Audio Amplifiers

1. Each audio power amplifier shall have integral audio signal de-multiplexers, allowing the amplifier to select any one of eight digitized audio channels. The channel selection shall be directed by the system software. Up to 8 multiple and different audio signals must be able to be broadcast simultaneously from the same system network node.
2. Each amplifier output shall include a dedicated, supervised 25/70 Vrms speaker circuit which is suitable for connection of emergency speaker appliances. Each amplifier shall also include a notification appliance circuit rated at 24Vdc @ 3.5A for connection of visible (strobe) appliances. This circuit shall be fully programmable and it shall be possible to define the circuit for the support of audible, visible, or ancillary devices.
3. Standby Audio amplifiers shall be provided that automatically sense the failure of a primary amplifier, and automatically program themselves to select and de-multiplex the same audio information channel of the failed primary amplifier, and fully replace the function of the failed amplifier.
4. In the event of a total loss of audio data communications, all amplifiers will default to the local "EVAC" tone generator channel. If the local panel has an alarm condition, then all amplifiers will sound the EVAC signal on their connected speaker circuits.
5. In the event of a loss of the fully digitized, multiplexed audio riser, the audio amplifiers shall automatically default to an internally generated alarm tone which shall be operated at a 3-3-3 temporal pattern.
6. Audio amplifiers shall automatically detect a short circuit condition on the connected speaker circuit wiring, and shall inhibit itself from driving into that short circuit condition.

Q. Power Supplies: The power supply shall be a high efficiency switch mode type with line monitoring to automatically switch to batteries for power failure or brown out conditions. The automatic battery charger shall have low battery discharge protection. The power supply shall provide internal power and 24 Vdc at 7.0A continuous for notification appliance circuits. The power supply shall be capable of providing 7A to output circuits for a maximum period of 100 ms. All outputs shall be power limited. The battery shall be sized to support the system for 24 hours of supervisory and trouble signal current plus general alarm for 15 minutes.

R. Auxiliary power supplies shall be a high efficiency switch mode type with line monitoring to automatically switch to batteries for power failure or brown out conditions. The automatic battery charger shall have low battery discharge protection. The power supply shall provide internal power and 24 Vdc at 7.0A continuous for notification appliance circuits. The power supply shall be capable of providing 7A to output circuits for a maximum period of 100 ms. All outputs shall be power limited. The battery shall be sized to support the system for 24 hours of supervisory and trouble signal current plus general alarm for 15 minutes.

S. Network alpha-numeric annunciators shall be located throughout the facility as indicated on the plans.

1. The system shall have the capacity to support 64 network annunciators or Honeywell Notifier Inspire network panel nodes. Each annunciator shall contain a supervised, back lit, liquid crystal with a minimum of 8 line with 21 characters per line. Where required, the annunciator shall include additional zonal annunciation and manual control without additional enclosures. The annunciator shall support full ability to serve as the operating interface to the system and shall include the following features;

   a. Matched appearance with other system displays
   b. Each LCD Display on each node (cabinet) in the system shall be configurable to show the status of any or all of the following functions anywhere in the system:

1) Alarm
2) Supervisory
3) Trouble
4) Monitor

2. Each annunciator must be capable of supporting custom messages as well as system event annunciation. It must be possible to filter unwanted annunciation of trouble, alarm or supervisory functions on a by point or by geographic area.
3. The annunciators shall be mounted in stand-alone enclosures or integrated into the network panels as indicated on the plans.

T. Surge Protection

1. Line Voltage Surge Protection: UL 1449 listed; provide for each line voltage circuit that supplies operating power for fire alarm system control equipment (e.g., FACU, field booster panels, nodes, and transponders).
2. Low Voltage Surge Protection: Listed, voltage/current ratings suitable for circuit to be protected; provide for each power limited low voltage circuit that exits protected premises.

U. Network Wiring

1. The system supplied under this specification shall utilize node to node, direct wired multi-priority peer-to-peer network operations. The system shall utilize independently addressed, smoke detectors, heat detectors and input/output modules as described in this specification. The peer-to-peer network shall contain multiple nodes consisting of the command center, main controller, remote control panels, LCD/LED annunciation nodes, and workstations. Each node is an equal, active functional node of the network, which is capable of making all local decisions and generating network tasks to other nodes in the event of node failure or communications failure between a nodes.
2. When wired using a Class A configuration, a single break or short on the network wiring causes the system to isolate the fault, and network communication continues uninterrupted, without any loss of function. Should multiple wiring faults occur, the network re-configures into many sub-networks and continues to respond to alarm events from every panel that can transmit and receive network messages.

V. Network Nodes

1. The remote control panel(s) (network nodes) shall meet the same requirements as described in control panel section and shall contain the following;

   a. Common control switches with 168 character LCD display, as required.
   b. Integral power supply(s) with secondary stand-by power.
   c. Signaling line circuits for communications with analog/addressable devices, as required.
   d. Audio amplification, as required.
   e. Notification appliance circuits, as required.
   f. Auxiliary function circuits and operations, as required.

W. Terminal Cabinets

1. Provide terminal cabinets with quantity of termination points as indicated or as required for application.

2. Cabinet: Steel, with red finish; permanently identified with text "FIRE ALARM TERMINAL CABINET"; keyed to match fire alarm system equipment.
3. Terminal Strips: Rated for 20 A at 250 VAC; terminal points rated for 12 AWG conductors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, the contract documents, and manufacturer's recommendations.

B. Manufacturer's Field Services: Provide services of a factory-authorized service representative to supervise the field assembly and connection of components and the pre testing, testing, and adjustment of the system.

C. Installation personnel shall be qualified and experienced in the installation, inspection, testing, and maintenance of fire alarm systems. Examples of qualified personnel shall include, but not be limited to, the following:

1. Factory trained and certified personnel.
2. National Institute of Certification in Engineering Technologies (NICET) fire alarm level II certified personnel.
3. International Municipal Signal Association (IMSA) fire alarm certified.
4. Trained and qualified personnel employed by an organization listed by a national testing laboratory for the servicing of fire alarm systems.
5. Personnel licensed or certified by state or local authority

D. Equipment Installation

1. Furnish and install a complete Fire Alarm System as described herein and as shown on the plans. Include sufficient control unit(s), annunciator(s), manual stations, smoke detectors, audible and visible notification appliances, wiring, terminations, electrical boxes, and all other necessary material for a complete operating system.
2. Water-Flow and Valve Supervisory Switches: Provide independent monitoring of all sprinkler water flow, pressure and tamper switches. Verify required Fire Alarm descriptors with AHJ prior to programming.
3. Provide independent monitoring of all devices/valves.
4. Device Location-Indicating Lights: Locate in the public space immediately adjacent to the device they monitor.
5. Mounting heights for pull stations shall be 42"-48" a.f.f. to operating handle.
6. Mounting heights for strobes and speaker/strobe signals shall be entire lens must be no less than 80" and not greater than 96" a.f.f.
7. Mounting heights for speaker only appliances shall be mounted so tops of speakers will be at 90" a.f.f, and a minimum 6" below ceiling.
8. Provide a minimum 3' distance of smoke detectors from supply diffusers, return grilles or ceiling fan blades.
9. All strobes shall be synchronized.

E. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

F. Obtain Owner's approval of locations of devices, before installation.

G. Install instruction cards and labels.

H. Wiring Installation:

1. System Wiring: Wire and cable shall be a type listed for its intended use by an approval agency acceptable to the Authority Having Jurisdiction (AHJ) and shall be installed in accordance with the appropriate articles from the current approved edition of NFPA 70: National Electric Code (NEC).
2. Contractor shall obtain from the Fire Alarm System Manufacturer written instruction regarding the appropriate wire/cable to be used for this installation. No deviation from the written instruction shall be made by the Contractor without the prior written approval of the Fire Alarm System Manufacturer.
3. Color Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color code for alarm initiating device circuits wiring and a different color code for supervisory circuits. Color-code notification appliance circuits differently from alarm-initiating circuits. Paint fire alarm system junction boxes and covers red.
4. Risers: Install at least 2 vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other, in accordance with NFPA 72, with a minimum 2-hour rated cable assembly, so the loss of one riser does not prevent the receipt or transmission of signal from other floors or zones.
5. Wiring to Campus Supervising Station: 1-inch conduit between the FACP and the existing campus fiber connection within the building as indicated. Install number of conductors and electrical supervision for connecting wiring as required to suit Campus Supervising Station monitoring function. Final connections to terminals in Campus Supervising Station transmitter are made under another contract.
6. Circuit Conductors: Copper; provide 200 feet extra; color code and label.
7. Metallic jacket wire shall be used.
8. Signaling line, initiating, and notification circuits cannot exceed 75% of the manufacturer's identified capacity.

I. Contractor will make all connections, but will hire Notifier Authorized Vendor for all programming, testing, and training, ect. Refer to section 3.2, and 3.4 for additional contractor requirements.

J. FACP messages must be approved by the engineer and that custom messages be provided as directed.

K. FACP descriptors utilize room/space designations and numbers to be used by the facility after occupancy and that descriptors be approved by the engineer and AHJ.

L. Contractor shall allow for three fire alarm system reprogramming after acceptance testing as directed by the Owner.

3.2 INSPECTION AND TESTING FOR COMPLETION

A. The contractor shall conduct a 100% pre-test of the fire alarm system as required per NFPA 72. The 100% pre-test shall include testing of all life safety functions with respective contractors (e.g. sprinkler monitoring, fan shut down, damper closure, door holder release, etc.).

1. Provide documentation of required pre-testing, including pre-testing of all life safety functions such as sprinkler monitoring, fan shut down, damper closure, and door holder release with responsible contractors. Submit pre-test documentation to Owner/AHJ prior to scheduling final acceptance testing.
2. After the fire alarm equipment vendor has performed a 100% pre-test of the system, and submitted required documentation, acceptance test of the fire alarm system shall be conducted by the contractor and the fire alarm equipment vendor with the authority having jurisdiction as directed by the Owner.
3. Prior to AHJ acceptance testing, contractor shall submit "Statement of Compliance" in accordance with FCNYS 901.2.1 requesting final acceptance test with authority having jurisdiction.
4. Contractor shall provide a "Record of Completion" form as identified in NFPA 72 figure 4-5.2.1, prior to Acceptance Testing with the AHJ.
5. Subsequent additions, modifications, and reprogramming of Fire Alarm system, including custom label changes, shall trigger Contractor Re-Acceptance Testing, and follow-up SUCF Re-Acceptance Testing.

B. Notify Owner 10 days minimum notice in writing prior to beginning completion inspections and tests.

C. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

D. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

E. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required. Provide documentation of required pre-testing, including pre-testing of all life safety functions such as sprinkler monitoring, elevator recall and shunt trip, kitchen suppression and door holder release with responsible contractors. Submit pre-test documentation to Owner/AHJ prior to scheduling final acceptance testing.

F. Provide all tools, software, and supplies required to accomplish inspection and testing.

G. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

H. Determine, through pre testing, the conformance of the system to the requirements of the Drawings and Specifications. Correct deficiencies observed in pre testing. Replace malfunctioning or damaged items with new and retest until satisfactory performance and conditions are achieved.

I. Final Test, Certificate of Completion, and Certificate of Occupancy:

J. Test the system as required by the Authority Having Jurisdiction in order to obtain a certificate of occupancy.

K. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents. Verify by the system test that the total system meets the Specifications and complies with applicable standards.

L. Report of Tests and Inspections: Provide a written record of inspections, tests, and detailed test results in the form of a test log.

M. Coordinate all testing of fire alarm monitoring of sprinkler tamper waterflow and pressure switches with the Division 21.

N. Coordinate all testing of fire/smoke damper closure, with Division 23.

O. Coordinate all testing of door holder release with the Division 8.

P. Coordinate testing of fire alarm monitoring of kitchen hood suppression system with Division 11.

Q. Coordinate fire alarm testing of elevator recall smoke detection with Division 14.

3.3 CLEANING AND ADJUSTING

A. Cleaning: Remove paint splatters and other spots, dirt, and debris. Clean unit internally using methods and materials recommended by manufacturer.

B. Occupancy Adjustments: When requested within one year of date of Substantial Completion, provide on-site assistance in adjusting sound levels and adjusting controls and sensitivities to suit actual occupied conditions. Provide up to three visits to the site for this purpose.

3.4 OWNER PERONNEL INSTRUCTION

A. Provide the services of a factory-authorized service representative to demonstrate the system and train Owner's maintenance personnel as specified below:

1. Basic Operation: Eight-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:

   a. Schedule, in writing, training with Owner at least seven days in advanced.
   b. Initial Training: 1 session pre-closeout.

2. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:

   a. Initial Training: 1 session pre-closeout.

3.5 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.

1. Be prepared to conduct any of the required tests.
2. Have at least one copy of operation and maintenance data, copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
3. Have authorized technical representative of control unit manufacturer present during demonstration.
4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.

5. Repeat demonstration until successful.

3.6 MAINTENANCE

A. Execution Requirements: Furnish service and maintenance of the system components for one year from the Date of Substantial Completion. This shall include all recommended and required preventative maintenance inspections/testing as outlined by the manufacturer and repairs to manufacturer or installer defects. All of this shall be provided at no charge to the Owner. Contractor at the completion of work shall submit to the Owner and Owners Representative a schedule indicating when inspections/testing will be conducted and an outline indicating what inspections/testing will be conducted on the system during the course of the warranty period.

B. All system service calls during the warranty period shall be handled in the following manner:

1. Owner shall contact the Electrical Contractor and initiate a service call who in turn shall contact the equipment vendor to respond and investigate the source of the service call.
2. If the equipment vendor establishes that the source of the service call is related to the electrical installation, the equipment vendor shall contact the Electrical Contractor for warranty service.
3. The Owner shall not be responsible for any charges during the warranty period that result in the Owner notifying the installing contractor of a defect in the system.
4. During construction and warranty period there shall be a required one hour phone response and a four hour on site response by a qualified technician time limit. All response outside of this service is in breach of contract.

3.7 WARRANTY

1. Call back response time shall be 24 hours 7 days a week.
2. On-site response time shall be 24 hours 7 days a week.

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SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for walks, pavements, turf and grasses, and plants.
3. Excavating and backfilling for buildings and structures.
4. Drainage course for concrete slabs-on-grade.
5. Subbase course for concrete walks and pavements.
6. Subbase course and base course for asphalt paving.
7. Subsurface drainage backfill for walls and trenches.
8. Excavating and backfilling trenches for utilities and pits for buried utility structures.

B. Related Requirements:

1. Section 013233 "Photographic Documentation" for recording pre-excavation and earth-moving progress.
2. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
3. Section 329300 "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.

1.2 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.

C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
2. Bulk Excavation: Excavation more than 10 feet (3 m) in width and more than 30 feet (9 m) in length.
3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, will be without additional compensation.

G. Fill: Soil materials used to raise existing grades.

H. Rock:

1. Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. (0.76 cu. m) for bulk excavation or 3/4 cu. yd. (0.57 cu. m) for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:

I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other fabricated stationary features constructed above or below the ground surface.

J. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.

K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

L. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct preexcavation conference at Project site.

1. Review methods and procedures related to earthmoving, including, but not limited to, the following:

a. Personnel and equipment needed to make progress and avoid delays.
b. Coordination of Work with utility locator service.
c. Coordination of Work and equipment movement with the locations of tree- and plant-protection zones.

d. Extent of trenching by hand or with air spade.
e. Field quality control.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:

1. Geotextiles.
2. Warning tapes.

B. Samples for Verification: For the following products, in sizes indicated below:

1. Geotextile: 12 by 12 inches (300 by 300 mm).
2. Warning Tape: 12 inches (300 mm) long; of each color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:

1. Classification according to ASTM D2487.
2. Laboratory compaction curve according to ASTM D698ASTM D1557.

C. Seismic survey report from seismic survey agency.

D. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

A. Seismic Survey Agency: An independent testing agency, acceptable to authorities having jurisdiction, experienced in seismic surveys and blasting procedures to perform the following services:

1. Report types of explosive and sizes of charge to be used in each area of rock removal, types of blasting mats, sequence of blasting operations, and procedures that will prevent damage to site improvements and structures on Project site and adjacent properties.
2. Seismographic monitoring during blasting operations.

B. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated.

1.7 FIELD CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

C. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures are in place.

D. Do not commence earth-moving operations until plant-protection measures are in place.

E. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

F. Do not direct vehicle or equipment exhaust towards protection zones.

G. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D2487, or a combination of these groups; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.

G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

H. Drainage Course: Narrowly graded mixture of **washed** crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and zero to 5 percent passing a No. 8 (2.36-mm) sieve.

I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and zero to 5 percent passing a No. 4 (4.75-mm) sieve.

J. Sand: ASTM C33/C33M; fine aggregate.

K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 GEOTEXTILES

A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability:

   a. Class 2; AASHTO M 288.
   b. As follows:

      1) Grab Tensile Strength: 157 lbf (700 N); ASTM D4632.
      2) Sewn Seam Strength: 142 lbf (630 N); ASTM D4632.
      3) Tear Strength: 56 lbf (250 N); ASTM D4533.
      4) Puncture Strength: 56 lbf (250 N); ASTM D4833.

c. Apparent Opening Size: No. 40 (0.425-mm) sieve, maximum; ASTM D4751.
d. Permittivity: 0.5 per second, minimum; ASTM D4491.
e. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.

B. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, made from polyolefins or polyesters; with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability:

a. Class 2; AASHTO M 288.
b. As follows:

1) Grab Tensile Strength: 247 lbf (1100 N); ASTM D4632.
2) Sewn Seam Strength: 222 lbf (990 N); ASTM D4632.
3) Tear Strength: 90 lbf (400 N); ASTM D4533.
4) Puncture Strength: 90 lbf (400 N); ASTM D4833.

c. Apparent Opening Size: No. 60 (0.250-mm) sieve, maximum; ASTM D4751.
d. Permittivity: 0.02 per second, minimum; ASTM D4491.
e. UV Stability: 50 percent after 500 hours' exposure; ASTM D4355.

2.3 ACCESSORIES

A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches (150 mm) wide and 4 mils (0.1 mm) thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches (750 mm) deep; colored as follows:

1. Red: Electric.
2. Yellow: Gas, oil, steam, and dangerous materials.
3. Orange: Telephone and other communications.
4. Blue: Water systems.
5. Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.

B. Protect and maintain erosion and sedimentation controls during earth-moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades.

B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

3.3 EXPLOSIVES

A. Explosives:

1. Do not use explosives.

3.4 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
2. Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:

a. 24 inches (600 mm) outside of concrete forms other than at footings.
b. 12 inches (300 mm) outside of concrete forms at footings.
c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.

e. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
f. [6 inches (150 mm) beneath pipe in trenches and the greater of 24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.

B. Classified Excavation: Excavate to subgrade elevations. Material to be excavated will be classified as earth and rock. Do not excavate rock until it has been classified and cross sectioned by Architect. The Contract Sum will be adjusted for rock excavation according to unit prices included in the Contract Documents. Changes in the Contract Time may be authorized for rock excavation.

1. Earth excavation includes excavating pavements and obstructions visible on surface; underground structures, utilities, and other items indicated to be removed; and soil, boulders, and other materials not classified as rock or unauthorized excavation.

2. Rock excavation includes removal and disposal of rock. Remove rock to lines and subgrade elevations indicated to permit installation of permanent construction without exceeding the following dimensions:

a. 24 inches (600 mm) outside of concrete forms other than at footings.
b. 12 inches (300 mm) outside of concrete forms at footings.
c. 6 inches (150 mm) outside of minimum required dimensions of concrete cast against grade.
d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
e. 6 inches (150 mm) beneath bottom of concrete slabs-on-grade.
f. 6 inches (150 mm) beneath pipe in trenches and the greater of 24 inches (600 mm) wider than pipe or [42 inches (1065 mm) wide.

3.5 EXCAVATION FOR STRUCTURES

A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch (25 mm). If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.

1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch (25 mm). Do not disturb bottom of excavations intended as bearing surfaces.

B. Excavations at Edges of Tree- and Plant-Protection Zones:

1. Excavate by hand or with an air spade to indicated lines, cross sections, elevations, and subgrades. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.

2. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.

1. Clearance: 12 inches (300 mm) each side of pipe or conduit.

C. Trench Bottoms:

1. Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

a. For pipes and conduit less than 6 inches (150 mm) in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
b. For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
c. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
d. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

2. Excavate trenches 4 inches (100 mm) deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.

a. Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

D. Trenches in Tree- and Plant-Protection Zones:

1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.
3. Cut and protect roots according to requirements in Section 015639 "Temporary Tree and Plant Protection."

3.8 SUBGRADE INSPECTION

A. Notify Architect when excavations have reached required subgrade.

B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.

C. Proof-roll subgrade below pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes) to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
2. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

D. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

E. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi (17.2 MPa), may be used when approved by Architect.

1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring, bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

D. Trenches under Roadways: Provide 4-inch- (100-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 033000 "Cast-in-Place Concrete."

E. Backfill voids with satisfactory soil while removing shoring and bracing.

F. Initial Backfill:

1. Soil Backfill: Place and compact initial backfill of subbase material, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.

   a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.

G. Final Backfill:

1. Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.

H. Warning Tape: Install warning tape directly above utilities, 12 inches (300 mm) below finished grade, except 6 inches (150 mm) below subgrade under pavements and slabs.

3.13 SOIL FILL

A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

B. Place and compact fill material in layers to required elevations as follows:

1. Under grass and planted areas, use satisfactory soil material.
2. Under walks and pavements, use satisfactory soil material.
3. Under steps and ramps, use engineered fill.
4. Under building slabs, use engineered fill.
5. Under footings and foundations, use engineered fill.

C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D698:

1. Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches (300 mm) of existing subgrade and each layer of backfill or fill soil material at 95 percent.
2. Under walkways, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 92 percent.
3. Under turf or unpaved areas, scarify and recompact top 6 inches (150 mm) below subgrade and compact each layer of backfill or fill soil material at 85 percent.
4. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

3.16 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:

1. Turf or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks: Plus or minus 1 inch (25 mm).
3. Pavements: Plus or minus 1/2 inch (13 mm).

C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch (13 mm) when tested with a 10-foot (3-m) straightedge.

3.17 SUBSURFACE DRAINAGE

A. Subsurface Drain: Place subsurface drainage geotextile around perimeter of subdrainage trench. Place a 6-inch (150-mm) course of filter material on subsurface drainage geotextile to support subdrainage pipe. Encase subdrainage pipe in a minimum of 12 inches (300 mm) of filter material, placed in compacted layers 6 inches (150 mm) thick, and wrap in subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D698.

B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches (300 mm) of final subgrade, in compacted layers 6 inches (150 mm) thick. Overlay drainage backfill with one layer of subsurface drainage geotextile, overlapping sides and ends at least 6 inches (150 mm).

1. Compact each filter material layer to 85 percent of maximum dry unit weight according to ASTM D698.

3.18 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:

1. Install separation geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place base course material over subbase course under hot-mix asphalt pavement.
3. Shape subbase course and base course to required crown elevations and cross-slope grades.
4. Place subbase course and base course 6 inches (150 mm) or less in compacted thickness in a single layer.
5. Place subbase course and base course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
6. Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D698.

3.19 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course 6 inches (150 mm) or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches (150 mm) in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches (150 mm) thick or less than 3 inches (75 mm) thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than **95** percent of maximum dry unit weight according to ASTM D698.

3.20 FIELD QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified geotechnical engineering testing agency to perform tests and inspections.

B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Architect.

D. Testing agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2937, and ASTM D6938, as applicable. Tests will be performed at the following locations and frequencies:

1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. (186 sq. m) or less of paved area or building slab but in no case fewer than three tests.
2. Foundation Wall Backfill: At each compacted backfill layer, at least one test for every 100 feet (30 m) or less of wall length but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet (46 m) or less of trench length but no fewer than two tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.21 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.

1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.

1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Hot-mix asphalt paving.
2. Hot-mix asphalt overlay.
3. Cold milling of existing asphalt pavement.
4. Hot-mix asphalt patching.

B. Related Requirements:

1. Section 312000 "Earth Moving" for subgrade preparation, fill material, separation geotextiles, unbound-aggregate subbase and base courses, and aggregate pavement shoulders.
2. Section 321313 "Concrete Paving" for concrete pavement and for separate concrete curbs, gutters, and driveway aprons.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:

   a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
   b. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.

2. Contractor shall supply a paving plan to coordinate concrete sidewalk and stamped asphalt paving operations. Contractor shall show phasing of installation so as to not damage newly poured concrete to install asphalt pavement.

1.4 ACTION SUBMITTALS

A. Product Data: Include technical data and tested physical and performance properties.

1. Herbicide.
2. Paving geotextile.
3. Joint sealant.

B. Hot-Mix Asphalt Designs:

1. Certification, by authorities having jurisdiction, of approval of each hot-mix asphalt design proposed for the Work.
2. For each hot-mix asphalt design proposed for the Work.

C. Samples for Verification: For the following product, in manufacturer's standard sizes unless otherwise indicated:

1. Paving Geotextile: 12 by 12 inches (300 by 300 mm) minimum.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For paving-mix manufacturer and testing agency.

B. Material Certificates: Include statement that mixes containing recycled materials will perform equal to mixes produced from all new materials.

1. Aggregates.
2. Asphalt binder.
3. Asphalt cement.
4. Cutback prime coat.
5. Emulsified asphalt prime coat.
6. Tack coat.

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: A paving-mix manufacturer registered with and approved by authorities having jurisdiction or the DOT of state in which Project is located.

B. Testing Agency Qualifications: Qualified in accordance with ASTM D3666 for testing indicated.

C. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of NYSDOT for asphalt paving work.

1. Measurement and payment provisions and safety program submittals included in standard specifications do not apply to this Section.

1.7 FIELD CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
2. Tack Coat: Minimum surface temperature of 60 deg F (15.6 deg C).
3. Slurry Coat: Comply with weather limitations in ASTM D3910.
4. Asphalt Base Course and Binder Course: Minimum surface temperature of 40 deg F (4.4 deg C) and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F (15.6 deg C) at time of placement.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D692/D692M, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: ASTM D1073 or AASHTO M 29, sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: ASTM D242/D242M or AASHTO M 17, rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: ASTM D6373 or AASHTO M 320 binder designation PG 58-28.

B. Asphalt Cement: ASTM D3381/D3381M for viscosity-graded material.

C. Cutback Prime Coat: ASTM D2027/D2027M, medium-curing cutback asphalt, MC-30 or MC-70.

D. Emulsified Asphalt Prime Coat: ASTM D977 or AASHTO M 140 emulsified asphalt, or ASTM D2397/D2397M or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

E. Tack Coat: ASTM D977 or AASHTO M 140 emulsified asphalt, or ASTM D2397/D2397M or AASHTO M 208 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

F. Water: Potable.

2.3 AUXILIARY MATERIALS

A. Recycled Materials for Hot-Mix Asphalt Mixes: Reclaimed asphalt pavement; reclaimed, unbound-aggregate base material; and recycled tires, asphalt shingles or glass from sources and gradations that have performed satisfactorily in previous installations, equal to performance of required hot-mix asphalt paving produced from all new materials.

B. Sand: ASTM D1073or AASHTO M 29, Grade No. 2 or No. 3.

C. Paving Geotextile: AASHTO M 288 paving fabric; nonwoven polypropylene; resistant to chemical attack, rot, and mildew; and specifically designed for paving applications.

D. Joint Sealant: ASTM D6690, Type I, hot-applied, single-component, polymer-modified bituminous sealant.

2.4 MIXES

A. Hot-Mix Asphalt: Dense-graded, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.

B. Emulsified-Asphalt Slurry: ASTM D3910, Type 1.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protection: Provide protective materials, procedures, and worker training to prevent asphalt materials from spilling, coating, or building up on curbs, driveway aprons, manholes, and other surfaces adjacent to the Work.

B. Proof-roll subgrade below pavements with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades.

1. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof-roll with a loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

3.3 COLD MILLING

A. Clean existing pavement surface of loose and deleterious material immediately before cold milling. Remove existing asphalt pavement by cold milling to grades and cross sections indicated.

1. Mill to a depth of 2 inches (50 mm).
2. Mill to a uniform finished surface free of excessive gouges, grooves, and ridges.
3. Control rate of milling to prevent tearing of existing asphalt course.
4. Repair or replace curbs, driveway aprons, manholes, and other construction damaged during cold milling.
5. Excavate and trim unbound-aggregate base course, if encountered, and keep material separate from milled hot-mix asphalt.
6. Patch surface depressions deeper than 1 inch (25 mm) after milling, before wearing course is laid.
7. Handle milled asphalt material in accordance with approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."
8. Keep milled pavement surface free of loose material and dust.
9. Do not allow milled materials to accumulate on-site.

3.4 PATCHING

A. Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches (300 mm) into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Portland Cement Concrete Pavement: Break cracked slabs and roll as required to reseat concrete pieces firmly.

1. Undersealing: Pump hot undersealing asphalt under rocking slab until slab is stabilized or, if necessary, crack slab into pieces and roll to reseat pieces firmly.
2. Remove disintegrated or badly cracked pavement. Excavate rectangular or trapezoidal patches, extending into perimeter of adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Recompact existing unbound-aggregate base course to form new subgrade.

C. Tack Coat: Before placing patch material, apply tack coat uniformly to vertical asphalt surfaces abutting the patch. Apply at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

D. Placing Single-Course Patch Material: Fill excavated pavement areas with hot-mix asphalt base mix for full thickness of patch and, while still hot, compact flush with adjacent surface.

E. Placing Two-Course Patch Material: Partially fill excavated pavements with hot-mix asphalt base course mix and, while still hot, compact. Cover asphalt base course with compacted layer of hot-mix asphalt surface course, finished flush with adjacent surfaces.

3.5 REPAIRS

A. Leveling Course: Install and compact leveling course consisting of hot-mix asphalt surface course to level sags and fill depressions deeper than 1 inch (25 mm) in existing pavements.

1. Install leveling wedges in compacted lifts not exceeding 3 inches (75 mm) thick.

B. Crack and Joint Filling: Remove existing joint filler material from cracks or joints to a depth of 1/4 inch (6 mm).

1. Clean cracks and joints in existing hot-mix asphalt pavement.
2. Use emulsified-asphalt slurry to seal cracks and joints less than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.
3. Use hot-applied joint sealant to seal cracks and joints more than 1/4 inch (6 mm) wide. Fill flush with surface of existing pavement and remove excess.

3.6 SURFACE PREPARATION

A. Ensure that prepared subgrade has been proof-rolled and is ready to receive paving. Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces.

B. Cutback Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd. (0.7 to 2.3 L/sq. m). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

C. Emulsified Asphalt Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.10 to 0.30 gal./sq. yd. per inch depth (0.5 to 1.40 L/sq. m per 25 mm depth). Apply enough material to penetrate and seal, but not flood, surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd. (0.2 to 0.7 L/sq. m).

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.7 HOT-MIX ASPHALT PLACEMENT

A. Machine place hot-mix asphalt on prepared surface, spread uniformly, and strike off. Place asphalt mix by hand in areas inaccessible to equipment in a manner that prevents segregation of mix. Place each course to required grade, cross section, and thickness when compacted.

1. Place hot-mix asphalt base course and binder course in number of lifts and thicknesses indicated.
2. Place hot-mix asphalt surface course in single lift.
3. Spread mix at a minimum temperature of 250 deg F (121 deg C).
4. Begin applying mix along centerline of crown for crowned sections and on high side of one-way slopes unless otherwise indicated.
5. Regulate paver machine speed to obtain smooth, continuous surface free of pulls and tears in asphalt-paving mat.

B. Place paving in consecutive strips not less than 10 feet (3 m) wide unless infill edge strips of a lesser width are required.

1. After first strip has been placed and rolled, place succeeding strips and extend rolling to overlap previous strips. Overlap mix placement about 1 to 1-1/2 inches (25 to 38 mm) from strip to strip to ensure proper compaction of mix along longitudinal joints.
2. Complete a section of asphalt base course and binder course before placing asphalt surface course.

C. Promptly correct surface irregularities in paving course behind paver. Use suitable hand tools to remove excess material forming high spots. Fill depressions with hot-mix asphalt to prevent segregation of mix; use suitable hand tools to smooth surface.

3.8 JOINTS

A. Construct joints to ensure a continuous bond between adjoining paving sections. Construct joints free of depressions, with same texture and smoothness as other sections of hot-mix asphalt course.

1. Clean contact surfaces and apply tack coat to joints.
2. Offset longitudinal joints, in successive courses, a minimum of 6 inches (150 mm).
3. Offset transverse joints, in successive courses, a minimum of 24 inches (600 mm).
4. Construct transverse joints at each point where paver ends a day's work and resumes work at a subsequent time. Construct these joints using either "bulkhead" or "papered" method in accordance with AI MS-22, for both "Ending a Lane" and "Resumption of Paving Operations.".
5. Compact joints as soon as hot-mix asphalt will bear roller weight without excessive displacement.
6. Compact asphalt at joints to a density within 2 percent of specified course density.

3.9 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F (85 deg C).

B. Breakdown Rolling: Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness. Correct laydown and rolling operations to comply with requirements.

C. Intermediate Rolling: Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to the following density:

1. Average Density, Marshall Test Method: 96 percent of reference laboratory density in accordance with ASTM D6927 or AASHTO T 245, but not less than 94 percent or greater than 100 percent.
2. Average Density, Rice Test Method: 92 percent of reference maximum theoretical density in accordance with ASTM D2041/D2041M, but not less than 90 percent or greater than 96 percent.

D. Finish Rolling: Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.

E. Edge Shaping: While surface is being compacted and finished, trim edges of pavement to proper alignment. Bevel edges while asphalt is still hot; compact thoroughly.

F. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

G. Protection: After final rolling, do not permit vehicular traffic on pavement until it has cooled and hardened.

H. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.10 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce thickness indicated within the following tolerances:

1. Base Course and Binder Course: Plus or minus 1/2 inch (13 mm).
2. Surface Course: Plus 1/4 inch (6 mm), no minus.

B. Pavement Surface Smoothness: Compact each course to produce surface smoothness within the following tolerances as determined by using a 10-foot (3-m) straightedge applied transversely or longitudinally to paved areas:

1. Base Course and Binder Course: 1/4 inch (6 mm).
2. Surface Course: 1/8 inch (3 mm).

3.11 SURFACE TREATMENTS

A. Slurry Seals: Apply slurry coat in a uniform thickness in accordance with ASTM D3910 and allow to cure.

1. Roll slurry seal to remove ridges and provide a uniform, smooth surface.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Thickness: In-place compacted thickness of hot-mix asphalt courses will be determined in accordance with ASTM D3549/D3549M.

C. Surface Smoothness: Finished surface of each hot-mix asphalt course will be tested for compliance with smoothness tolerances.

D. In-Place Density: Testing agency will take samples of uncompacted paving mixtures and compacted pavement in accordance with ASTM D979/D979M or AASHTO T 168.

1. Reference maximum theoretical density will be determined by averaging results from four samples of hot-mix asphalt-paving mixture delivered daily to site, prepared in accordance with ASTM D2041/D2041M, and compacted in accordance with job-mix specifications.
2. In-place density of compacted pavement will be determined by testing core samples in accordance with ASTM D1188 or ASTM D2726/D2726M.

a. One core sample will be taken for every 1000 sq. yd. (836 sq. m) or less of installed pavement, with no fewer than three cores taken.
b. Field density of in-place compacted pavement may also be determined by nuclear method in accordance with ASTM D2950/D2950M and coordinated with ASTM D1188 or ASTM D2726/D2726M.

E. Replace and compact hot-mix asphalt where core tests were taken.

F. Remove and replace or install additional hot-mix asphalt where test results or measurements indicate that it does not comply with specified requirements.

3.13 WASTE HANDLING

A. General: Handle asphalt-paving waste in accordance with approved waste management plan required in Section 017419 "Construction Waste Management and Disposal."

END OF SECTION 321216

SECTION 321313 - CONCRETE PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes concrete paving. including the following:

1. Utility Pads.
2. Walks.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.

B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to concrete paving, including but not limited to, the following:

   a. Concrete mixture design.
   b. Quality control of concrete materials and concrete paving construction practices.

2. Require representatives of each entity directly concerned with concrete paving to attend, including the following:

   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete paving Subcontractor.
   e. Manufacturer's representative of stamped concrete paving system used for stamped detectable warnings.

3. Contractor shall supply a paving plan to coordinate concrete sidewalk and stamped asphalt paving operations. Contractor shall show phasing of installation so as to not damage newly poured concrete to install asphalt pavement. Show joint pattern on plan as well.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.

C. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.

B. Material Certificates: For the following, from manufacturer:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Fiber reinforcement.
4. Admixtures.
5. Curing compounds.
6. Applied finish materials.
7. Bonding agent or epoxy adhesive.
8. Joint fillers.

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

A. Stamped Detectable Warning Installer Qualifications: An employer of workers trained and approved by manufacturer of stamped concrete paving systems.

B. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities" (Quality Control Manual - Section 3, "Plant Certification Checklist").

C. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests must be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.
2. Build mockups of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Architect and not less than 96 inches (2400 mm) by 96 inches (2400 mm).
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing on concrete paving mixtures.

1.8 FIELD CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:

1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
2. Do not use frozen materials or materials containing ice or snow.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.

C. Hot-Weather Concrete Placement: Comply with ACI 301 (ACI 301M) and as follows when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

1. Use flexible or uniformly curved forms for curves with a radius of 100 feet (30.5 m) or less.

B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

A. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, fabricated from as-drawn steel wire into flat sheets.

B. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.

C. Reinforcing Bars: ASTM A615/A615M, Grade 60 (Grade 420); deformed.

D. Galvanized Reinforcing Bars: ASTM A767/A767M, Class II zinc coated, hot-dip galvanized after fabrication and bending; with ASTM A615/A615M, Grade 60 (Grade 420) deformed bars.

E. Epoxy-Coated Reinforcing Bars: ASTM A775/A775M or ASTM A934/A934M; with ASTM A615/A615M, Grade 60 (Grade 420) deformed bars.

F. Deformed-Steel Wire: ASTM A1064/A1064M.

G. Epoxy-Coated-Steel Wire: ASTM A884/A884M, Class A; coated, [plain] [deformed].

H. Joint Dowel Bars: ASTM A615/A615M, Grade 60 (Grade 420) plain-steel bars; zinc coated (galvanized) after fabrication according to ASTM A767/A767M, Class I coating. Cut bars true to length with ends square and free of burrs.

I. Tie Bars: ASTM A615/A615M, Grade 60 (Grade 420); deformed.

J. Hook Bolts: ASTM A307, Grade A (ASTM F568M, Property Class 4.6), internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and

in position during concreting operations, and to permit removal without damage to concrete or hook bolt.

K. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:

1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.

L. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

M. Zinc Repair Material: ASTM A780/A780M.

2.4 CONCRETE MATERIALS

A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:

1. Portland Cement: ASTM C150/C150M, gray portland cement Type I/II.
2. Fly Ash: ASTM C618, [Class C] [or] [Class F].
3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
4. Blended Hydraulic Cement: ASTM C595/C595M, Type IS, portland blast-furnace slag.

B. Normal-Weight Aggregates: ASTM C33/C33M, Class 4S, uniformly graded. Provide aggregates from a single source with documented service-record data of at least 10 years' satisfactory service in similar paving applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 1-1/2 inches (38 mm) nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Air-Entraining Admixture: ASTM C260/C260M.

D. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

E. Water: Potable and complying with ASTM C94/C94M.

2.5 FIBER REINFORCEMENT

A. Synthetic Fiber, Monofilament Fibers: Monofilament polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C1116/C1116M, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.

B. Synthetic Fiber, Fibrillated Fibers: Fibrillated polypropylene fibers engineered and designed for use in decorative concrete paving, complying with ASTM C1116/C1116M, Type III, 1/2 to 1-1/2 inches (13 to 38 mm) long.

2.6 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.

B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Evaporation Retarder: Waterborne, monomolecular, film forming, manufactured for application to fresh concrete.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.

F. White, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 2, Class B, dissipating.

2.7 RELATED MATERIALS

A. Joint Fillers: ASTM D1751, asphalt-saturated cellulosic fiber in preformed strips.

B. Slip-Resistive Aggregate Finish: Factory-graded, packaged, rustproof, nonglazing, abrasive aggregate of fused aluminum-oxide granules or crushed emery aggregate containing not less than 50 percent aluminum oxide and not less than 20 percent ferric oxide; unaffected by freezing, moisture, and cleaning materials.

C. Bonding Agent: ASTM C1059/C1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

D. Epoxy-Bonding Adhesive: ASTM C881/C881M, two-component epoxy resin capable of humid curing and bonding to damp surfaces; of class suitable for application temperature, of grade complying with requirements, and of the following types:

1. Types I and II, nonload bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

E. Chemical Surface Retarder: Water-soluble, liquid, set retarder with color dye, for horizontal concrete surface application, capable of temporarily delaying final hardening of concrete to a depth of 1/8 to 1/4 inch (3 to 6 mm).

2.8 CONCRETE MIXTURES

A. Prepare design mixtures, proportioned according to ACI 301 (ACI 301M), for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.

1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.

B. Cementitious Materials: Use fly ash, pozzolan, slag cement, and silica fume as needed to reduce the total amount of portland cement, which would otherwise be used, by not less than 40 percent.

C. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:

1. Air Content, 1-1/2-inch (38-mm) Nominal Maximum Aggregate Size: 5-1/2 percent plus or minus 1-1/2 percent.

D. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

E. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing admixture in concrete as required for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

F. Synthetic Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd. (0.60 kg/cu. m).

G. Concrete Mixtures: Normal-weight concrete.

1. Compressive Strength (28 Days): 4500 psi (31 MPa).
2. Maximum W/C Ratio at Point of Placement: 0.45.
3. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M and ASTM C1116/C1116M. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.

1. For concrete batches of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
2. For concrete batches larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.

B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.

1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph (5 km/h).
2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons (13.6 tonnes).
3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch (13 mm) according to requirements in Section 312000 "Earth Moving."

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove loose material from compacted subbase surface immediately before placing concrete.

3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

3.4 INSTALLATION OF STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.

C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.

D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

E. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch (50-mm) overlap of adjacent mats.

3.5 JOINTS

A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.

1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.

1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
2. Provide tie bars at sides of paving strips where indicated.
3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
4. Keyed Joints: Provide preformed keyway-section forms or bulkhead forms with keys unless otherwise indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.

5. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.

1. Locate expansion joints at intervals of 50 feet (15.25 m) unless otherwise indicated.
2. Extend joint fillers full width and depth of joint.
3. Terminate joint filler not less than 1/2 inch (13 mm) or more than 1 inch (25 mm) below finished surface if joint sealant is indicated.
4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.

D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows, to match jointing of existing adjacent concrete paving:

1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint with grooving tool to a 1/4-inch (6-mm) radius. Repeat grooving of contraction joints after applying surface finishes. Eliminate grooving-tool marks on concrete surfaces.

   a. Tolerance: Ensure that grooved joints are within 3 inches (75 mm) either way from centers of dowels.

2. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

E. Edging: After initial floating, tool edges of paving, gutters, curbs, and joints in concrete with an edging tool to a 1/4-inch (6-mm) radius. Repeat tooling of edges after applying surface finishes. Eliminate edging-tool marks on concrete surfaces.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.

B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.

C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

D. Comply with ACI 301 (ACI 301M) requirements for measuring, mixing, transporting, and placing concrete.

E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.

F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.

G. Consolidate concrete according to ACI 301 (ACI 301M) by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.

1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.

H. Screed paving surface with a straightedge and strike off.

I. Commence initial floating using bull floats or darbies to impart an open-textured and uniform surface plane before excess moisture or bleedwater appears on the surface. Do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

J. Curbs and Gutters: Use design mixture for automatic machine placement. Produce curbs and gutters to required cross section, lines, grades, finish, and jointing.

K. Slip-Form Paving: Use design mixture for automatic machine placement. Produce paving to required thickness, lines, grades, finish, and jointing.

1. Compact subbase and prepare subgrade of sufficient width to prevent displacement of slip-form paving machine during operations.

3.7 FLOAT FINISHING

A. General: Do not add water to concrete surfaces during finishing operations.

B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.

1. Medium-to-Coarse-Textured Broom Finish: Provide a coarse finish by striating float-finished concrete surface 1/16 to 1/8 inch (1.6 to 3 mm) deep with a stiff-bristled broom, perpendicular to line of traffic.

3.8 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

B. Comply with ACI 306.1 for cold-weather protection.

C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h (1 kg/sq. m x h) before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.

D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.

E. Curing Methods: Cure concrete by moisture curing as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.
3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.9 PAVING TOLERANCES

A. Comply with tolerances in ACI 117 (ACI 117M) and as follows:

1. Elevation: 3/4 inch (19 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-feet- (3-m-) long; unleveled straightedge not to exceed 1/2 inch (13 mm).
4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches (13 mm per 300 mm) of tie bar.
5. Lateral Alignment and Spacing of Dowels: 1 inch (25 mm).
6. Vertical Alignment of Dowels: 1/4 inch (6 mm).

7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches (6 mm per 300 mm) of dowel.
8. Joint Spacing: 3 inches (75 mm).
9. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
10. Joint Width: Plus 1/8 inch (3 mm), no minus.

3.10 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C172/C172M will be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143/C143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C231/C231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when it is 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C31/C31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C39/C39M; test one specimen at seven days and two specimens at 28 days.

    a. A compressive-strength test to be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results to be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests to contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency will make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Concrete paving will be considered defective if it does not pass tests and inspections.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

I. Prepare test and inspection reports.

3.11 REPAIR AND PROTECTION

A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.

C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.

D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cold-applied joint sealants.
2. Hot-applied joint sealants.
3. Joint-sealant backer materials.
4. Primers.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. Concrete pavement joint sealants.
2. Joint-sealant backer materials.

B. Samples for Initial Selection: Manufacturer's standard color sheets, showing full range of available colors for each type of joint sealant.

C. Samples for Verification: Actual sample of finished products for each kind and color of joint sealant required.

1. Size: Joint sealants in 1/2-inch- (13-mm-) wide joints formed between two 6-inch- (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Paving-Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Statements: For Installer.

1.5 QUALITY ASSURANCE

A. Qualifications:

1. Installers: Entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 PRECONSTRUCTION TESTING

A. Preconstruction Testing: Performed by a qualified testing agency.

1.7 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (5 deg C).
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 SOURCE LIMITATIONS

A. Obtain joint sealants from single manufacturer for each sealant type.

2.2 JOINT SEALANTS, GENERAL

A. Compatibility: Provide joint sealants, backer materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.3 COLD-APPLIED JOINT SEALANTS

A. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D5893/D5893M, Type NS.

B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D5893/D5893M, Type SL.

2.4 HOT-APPLIED JOINT SEALANTS

A. Hot-Applied, Single-Component Joint Sealant, Type I or Type II: ASTM D6690.

2.5 JOINT-SEALANT BACKER MATERIALS

A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

B. Round Backer Rods for Cold- and Hot-Applied Joint Sealants: ASTM D5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

2.6 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

3.3 INSTALLATION OF JOINT SEALANTS

A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions.

C. Install joint-sealant backers to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of joint-sealant backer materials.
2. Do not stretch, twist, puncture, or tear joint-sealant backer materials.
3. Remove absorbent joint-sealant backer materials that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants immediately following backer material installation, using proven techniques that comply with the following:

1. Place joint sealants so they fully contact joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants in accordance with the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

1. Remove excess joint sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING AND PROTECTION

A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

B. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

3.5 PAVING-JOINT-SEALANT SCHEDULE

A. Joints within concrete paving:

1. Joint Location:

   a. Expansion and isolation joints in concrete paving.
   b. Contraction joints in concrete paving.
   c. Other joints as indicated.

2. Joint Sealant: Single-component, nonsag, silicone joint sealant or Single-component, self-leveling, silicone joint sealant.
3. Joint-Sealant Color: Manufacturer's standard.

B. Joints within concrete paving and between concrete and asphalt paving:

1. Joint Location:

   a. Joints between concrete and asphalt paving.
   b. Joints between concrete curbs and asphalt paving.
   c. Other joints as indicated.

2. Joint Sealant: Hot-applied, single-component joint sealant.
3. Joint-Sealant Color: Manufacturer's standard.

END OF SECTION 321373

SECTION 321400 - UNIT PAVING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Permeable Interlocking Concrete Pavement.
2. Curbs and edge restraints.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.3 ACTION SUBMITTALS

A. Product Data:

1. For materials other than water and aggregates.
2. For the following:

a. Pavers.
b. Edge restraints.

B. Sieve Analyses: For aggregate setting-bed materials, according to ASTM C136.

C. Samples for Initial Selection: For each type of unit paver indicated, and the following:

1. Joint materials involving color selection.

D. Samples for Verification: For full-size units of each type of unit paver indicated.

1. Joint materials.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with standards. Provide for each type and size of unit.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for unit pavers, indicating compliance with requirements.

1. For solid interlocking paving units, include test data for freezing and thawing according to ASTM C67.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified unit paving installer. Installer's field supervisor must have Concrete Paver Installer Certification from the Interlocking Concrete Pavement Institute (ICPI) with **one of** the following designations:

1. Commercial Paver Technician Designation.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

1.7 FIELD CONDITIONS

A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain each type of unit paver, joint material, and setting material from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

2.2 PERMEABLE INTERLOCKING CONCRETE PAVERS

A. Concrete Pavers, Solid Interlocking Paving Units: Complying with ASTM C936/C936M and resistant to freezing and thawing when tested according to ASTM C67, made from normal-weight aggregates.

1. Aqualine 9L - Thickness: 3-1/8 inches (80 mm).

2. Finish: Standard (Smooth)Face Size and Shape:

3. Color: As selected by Architect from manufacturer's full range.

2.3 CURBS AND EDGE RESTRAINTS

A. Aluminum Edge Restraints: Manufacturer's standard straight, 3/16-inch- (4.8 mm-) thick by 4-inch- (100-mm-) high extruded-aluminum edging with loops pressed from face to receive stakes at 12 inches (300 mm) O.C. and aluminum stakes 12 inches (300 mm) long for each loop.

B. Job-Built Concrete Edge Restraints: restrained by concrete sidewalk.

2.4 AGGREGATE SETTING-BED MATERIALS

A. Graded Aggregate for Subbase: Sound, crushed stone or gravel complying with ASTM D448 for Size No. 57.

B. Graded Aggregate for Base: Sound, crushed stone or gravel complying with ASTM D448 for Size No. 8.

C. Stone Screenings for Leveling Course: Sound stone screenings complying with ASTM D448 for Size No. 10.

D. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 (1.18-mm) sieve and no more than 10 percent passing No. 200 (0.075-mm) sieve.

1. Provide sand of color needed to produce required joint color.

E. Separation Geotextile: Woven geotextile fabric, manufactured for separation applications; made from polyolefins or polyesters, with elongation less than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2, AASHTO M 288.
2. Apparent Opening Size: No. 60 (0.250-mm) sieve, maximum; ASTM D4751.
3. Permittivity: 0.02 per second, minimum; ASTM D4491.
4. UV Stability: 50 percent after 500 hours' exposure, ASTM D4355.

F. Drainage Geotextile: Nonwoven needle-punched geotextile fabric, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50

percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

1. Survivability: Class 2, AASHTO M 288.
2. Apparent Opening Size: No. 40 (0.425-mm) sieve, maximum; ASTM D4751.
3. Permittivity: 0.5 per second, minimum; ASTM D4491.
4. UV Stability: 50 percent after 500 hours' exposure, ASTM D4355.

G. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

H. Water: Potable.

I. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches (50.8 by 50.8 mm) by 0.062 inch (1.57 mm) in diameter; comply with ASTM A1064/A1064M except for minimum wire size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces indicated to receive unit paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.

3.2 PREPARATION

A. Proof-roll prepared subgrade according to requirements in Section 312000 "Earth Moving" to identify soft pockets and areas of excess yielding. Proceed with unit paver installation only after deficient subgrades have been corrected and are ready to receive subbase and base course for unit pavers.

3.3 INSTALLATION, GENERAL

A. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.

B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

1. For concrete pavers, a block splitter may be used.

D. Handle protective-coated brick pavers to prevent coated surfaces from contacting backs or edges of other units. If, despite these precautions, coating does contact bonding surfaces of brick, remove coating from bonding surfaces before setting brick.

E. Joint Pattern: Running bond.

F. Tolerances:

1. Do not exceed 1/16-inch (1.6-mm) unit-to-unit offset from flush (lippage) nor 1/8 inch in 24 inches (3 mm in 600 mm) and] 1/4 inch in 10 feet (6 mm in 3 m) from level, or indicated slope, for finished surface of paving.

3.4 AGGREGATE SETTING-BED APPLICATIONS

A. Compact soil subgrade uniformly to at least 95 percent of ASTM D698 laboratory density.

B. Proof-roll prepared subgrade to identify soft pockets and areas of excess yielding. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.

C. Place separation geotextile over prepared subgrade, overlapping ends and edges at least 12 inches (300 mm).

D. Place aggregate subbase and base, compact to 100 percent of ASTM D1557 maximum laboratory density, and screed to depth indicated.

E. Place drainage geotextile over compacted base course, overlapping ends and edges at least 12 inches (300 mm).

F. Place leveling course and screed to a thickness of 1 to 1-1/2 inches (25 to 38 mm), taking care that moisture content remains constant and density is loose and uniform until pavers are set and compacted.

G. Treat leveling course with herbicide to inhibit growth of grass and weeds.

H. Set pavers with a minimum joint width of 1/16 inch (1.5 mm) and a maximum of 1/8 inch (3 mm), being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines. Fill gaps between units that exceed 3/8 inch (10 mm) with pieces cut to fit from full-size unit pavers.

1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.

I. Spread dry sand and fill joints immediately after vibrating pavers into leveling course. Vibrate pavers and add sand until joints are completely filled, then remove excess sand. Leave a slight surplus of sand on the surface for joint filling.

J. Do not allow traffic on installed pavers until sand has been vibrated into joints.

K. Repeat joint-filling process 30 days later.

3.5 REPAIRING, POINTING, AND CLEANING

A. Remove and replace unit pavers that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Provide new units to match adjoining units and install in same manner as original units, with same joint treatment and with no evidence of replacement.

B. Pointing: During tooling of joints, enlarge voids or holes and completely fill with grout. Point joints at sealant joints to provide a neat, uniform appearance, properly prepared for sealant application.

C. Cleaning: Remove excess grout from exposed paver surfaces; wash and scrub clean.

1. Remove temporary protective coating as recommended by coating manufacturer and as acceptable to paver and grout manufacturers.
2. Do not allow protective coating to enter floor drains. Trap, collect, and remove coating material.

END OF SECTION 321400

SECTION 329113 - SOIL PREPARATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes planting soils specified by composition of the mixes.

B. Related Requirements:
   1. Section 311000 "Site Clearing" for topsoil stripping and stockpiling.
   2. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.
   3. Section 329300 "Plants" for placing planting soil for plantings.

1.3 DEFINITIONS

A. AAPFCO: Association of American Plant Food Control Officials.

B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.

C. CEC: Cation exchange capacity.

D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.

E. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.

F. Imported Soil: Soil that is transported to Project site for use.

G. Layered Soil Assembly: A designed series of planting soils, layered on each other, that together produce an environment for plant growth.

H. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

I. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.

J. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."

K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

L. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.

M. SSSA: Soil Science Society of America.

N. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

O. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.

P. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.

Q. USCC: U.S. Composting Council.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include recommendations for application and use.
2. Include test data substantiating that products comply with requirements.
3. Include sieve analyses for aggregate materials.
4. Material Certificates: For each type of imported soil and soil amendment and fertilizer before delivery to the site, according to the following:

    a. Manufacturer's qualified testing agency's certified analysis of standard products.
    b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.

c. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.

B. Samples: For each bulk-supplied material, 1-quart (1-L) volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For each testing agency.

B. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.

C. Field quality-control reports.

1.7 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction soil analyses on existing, on-site soil.

1. Notify Architect seven days in advance of the dates and times when laboratory samples will be taken.

B. Preconstruction Soil Analyses: For each unamended soil type, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.

1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

1.9 SOIL-SAMPLING REQUIREMENTS

A. General: Extract soil samples according to requirements in this article.

B. Sample Collection and Labeling: Have samples taken and labeled by Contractor in presence of Architect under the direction of the testing agency.

1. Number and Location of Samples: Minimum of three representative soil samples from varied locations for each soil to be used or amended for landscaping purposes.
2. Procedures and Depth of Samples: According to USDA-NRCS's "Field Book for Describing and Sampling Soils."
3. Division of Samples: Split each sample into two, equal parts. Send half to the testing agency and half to Owner for its records.
4. Labeling: Label each sample with the date, location keyed to a site plan or other location system, visible soil condition, and sampling depth.

1.10 TESTING REQUIREMENTS

A. General: Perform tests on soil samples according to requirements in this article.

B. Physical Testing:

1. Soil Texture: Soil-particle, size-distribution analysis by one of the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":

   a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
   b. Hydrometer Method: Report percentages of sand, silt, and clay.

2. Total Porosity: Calculate using particle density and bulk density according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
3. Water Retention: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
4. Saturated Hydraulic Conductivity: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods"; at 85% compaction according to ASTM D698 (Standard Proctor).

C. Chemical Testing:

1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 1- Physical and Mineralogical Methods."

D. Fertility Testing: Soil-fertility analysis according to standard laboratory protocol of SSSA NAPT NCR-13, including the following:

1. Percentage of organic matter.
2. CEC, calcium percent of CEC, and magnesium percent of CEC.
3. Soil reaction (acidity/alkalinity pH value).
4. Buffered acidity or alkalinity.
5. Nitrogen ppm.

6. Phosphorous ppm.
7. Potassium ppm.
8. Manganese ppm.
9. Manganese-availability ppm.
10. Zinc ppm.
11. Zinc availability ppm.
12. Copper ppm.
13. Sodium ppm and sodium absorption ratio.
14. Soluble-salts ppm.
15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
16. Other deleterious materials, including their characteristics and content of each.

E. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."

F. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.

1. Fertilizers and Soil Amendment Rates: State recommendations in weight per 1000 sq. ft. (100 sq. m) for 6-inch (150-mm) depth of soil.
2. Soil Reaction: State the recommended liming rates for raising pH or sulfur for lowering pH according to the buffered acidity or buffered alkalinity in weight per 1000 sq. ft. (100 sq. m) for 6-inch (150-mm)depth of soil.

1.11 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Do not move or handle materials when they are wet or frozen.
4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PART 2 - PRODUCTS

2.1 PLANTING SOILS SPECIFIED BY COMPOSITION

A. General: Soil amendments, fertilizers, and rates of application specified in this article are guidelines that may need revision based on testing laboratory's recommendations after preconstruction soil analyses are performed.

B. Planting-Soil Type: Existing, on-site surface soil, with the duff layer, if any, retained; and stockpiled on-site; modified to produce viable planting soil. Blend existing, on-site surface soil with the following soil amendments and fertilizers in the following quantities to produce planting soil:

1. Ratio of Loose Compost to Soil: **1:4** by volume.

C. Planting-Soil Type: Imported, naturally formed soil from off-site sources and consisting of sandy loam soil according to USDA textures; and modified to produce viable planting soil.

1. Sources: Take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches (100 mm) deep, not from agricultural land, bogs, or marshes; and that do not contain undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants including, but not limited to, quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass.
2. Additional Properties of Imported Soil before Amending: Soil reaction of pH 6 to 7 and minimum of 4 percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.
3. Unacceptable Properties: Clean soil of the following:

a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 8 percent by dry weight of the imported soil.
c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 2 inches (50 mm) in any dimension.

2.2 INORGANIC SOIL AMENDMENTS

A. Lime: ASTM C602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:

1. Class: T, with a minimum of 99 percent passing through a No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through a No. 60 (0.25-mm) sieve.
2. Form: Provide lime in form of ground dolomitic limestone.

B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through a No. 40 (0.425-mm) sieve.

C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.

D. Perlite: Horticultural perlite, soil amendment grade.

E. Sand: Clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C33/C33M.

2.3 ORGANIC SOIL AMENDMENTS

A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:

1. Feedstock: Limited to leave.
2. Reaction: pH of 5.5 to 8.
3. Soluble-Salt Concentration: Less than 4 dS/m.
4. Moisture Content: 35 to 55 percent by weight.
5. Organic-Matter Content: 30 to 40 percent of dry weight.
6. Particle Size: Minimum of 98 percent passing through a 4-inch (100-mm) sieve.

B. Sphagnum Peat: Partially decomposed sphagnum peat moss, finely divided or of granular texture with 100 percent passing through a 1/2-inch (13-mm) sieve, a pH of 3.4 to 4.8, and a soluble-salt content measured by electrical conductivity of maximum 5 dS/m.

2.4 FERTILIZERS

A. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of [**20**] [**33**] [**50**] percent available phosphoric acid.

B. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition: 1 lb/1000 sq. ft. (0.5 kg/100 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

C. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition: 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.

2. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified testing agency.

PART 3 - EXECUTION

3.1 GENERAL

A. Place planting soil and fertilizers according to requirements in other Specification Sections.

B. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.

C. Proceed with placement only after unsatisfactory conditions have been corrected.

3.2 PREPARATION OF UNAMENDED, ON-SITE SOIL BEFORE AMENDING

A. Excavation: Excavate soil from designated area(s) to a depth of 8 inches (200 mm) and stockpile until amended.

B. Unacceptable Materials: Clean soil of concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.

C. Unsuitable Materials: Clean soil to contain a maximum of 8 percent by dry weight of stones, roots, plants, sod, clay lumps, and pockets of coarse sand.

3.3 PLACING AND MIXING PLANTING SOIL OVER EXPOSED SUBGRADE

A. General: Apply and mix unamended soil with amendments on-site to produce required planting soil. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.

B. Subgrade Preparation: Till subgrade to a minimum depth of 8 inches (200 mm). Remove stones larger than 1-1/2 inches (38 mm) in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply, add soil amendments, and mix approximately half the thickness of unamended soil over prepared, loosened subgrade according to "Mixing" Paragraph below. Mix thoroughly into top 2 inches (50 mm) of subgrade. Spread remainder of planting soil.

C. Mixing: Spread unamended soil to total depth of 8 inches (200 mm), but not less than required to meet finish grades after mixing with amendments and natural settlement. Finished grade of soil along hard surfaces (sidewalk, asphalt, pavers, etc.) shall be +1” minimum above pavement to allow settling. Do not spread if soil or subgrade is frozen, muddy, or excessively wet.

1. Amendments: Apply soil amendments, except compost, and fertilizer, if required, evenly on surface, and thoroughly blend them with unamended soil to produce planting soil.

    a. Mix lime and sulfur with dry soil before mixing fertilizer.
    b. Mix fertilizer with planting soil no more than seven days before planting.

2. Lifts: Apply and mix unamended soil and amendments in lifts not exceeding 8 inches (200 mm) in loose depth for material compacted by compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.

D. Compaction: Compact each blended lift of planting soil to 75 to 82 percent of maximum Standard Proctor density according to ASTM D698 and tested in-place.

E. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.4 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform the following tests and inspections:

1. Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D698. Space tests at no less than one for each 1000 sq. ft. (100 sq. m) of in-place soil or part thereof.

C. Soil will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

3.5 PROTECTION

A. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:

1. Storage of construction materials, debris, or excavated material.
2. Parking vehicles or equipment.
3. Vehicle traffic.
4. Foot traffic.
5. Erection of sheds or structures.
6. Impoundment of water.
7. Excavation or other digging unless otherwise indicated.

B. If planting soil or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Architect and replace contaminated planting soil with new planting soil.

3.6 CLEANING

A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.

B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.

END OF SECTION 329113

SECTION 329200 - TURF AND GRASSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Seeding.
2. Hydroseeding.
3. Sodding.
4. Turf renovation.

B. Related Requirements:

1. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.

1.3 DEFINITIONS

A. Finish Grade: Elevation of finished surface of planting soil.

B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.

C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.

D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329113 "Soil Preparation" and drawing designations for planting soils.

E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer.

B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.

C. Product Certificates: For fertilizers, from manufacturer.

D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf during a calendar year. Submit before expiration of required maintenance periods.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf establishment.

1. Professional Membership: Installer shall be a member in good standing of either the National Association of Landscape Professionals or AmericanHort.
2. Experience: Three years' experience in turf installation in addition to requirements in Section 014000 "Quality Requirements."
3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the National Association of Landscape Professionals:

   a. Landscape Industry Certified Technician - Exterior.
   b. Landscape Industry Certified Lawn Care Manager.
   c. Landscape Industry Certified Lawn Care Technician.

5. Pesticide Applicator: State licensed, commercial.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.

B. Sod: Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.

C. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

1.9 FIELD CONDITIONS

A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: March 15 – May 31.
2. Fall Planting: September 15 – October 31.

B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.

B. Seed Species:

1. Quality, State Certified: State-certified seed of grass species as listed below for solar exposure.
2. Sun and Partial Shade, Cool-Season Grass: Proportioned by weight as follows:

a. 30 percent Cayenne Tall Fescue
b. 25 percent Shortstop 3 Tall Fescue
c. 25 percent Firewall Tall Fescue
d. 10 percent Mercury Kentucky Bluegrass
e. 10 percent Express II Perennial Ryegrass

2.2 TURFGRASS SOD

A. Turfgrass Sod: Certified, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.

B. Turfgrass Species, Cool-Season Grass: Sod of grass species as follows, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
1. Sun and Partial Shade: Proportioned by weight as follows:

a. 30 percent Cayenne Tall Fescue
b. 25 percent Shortstop 3 Tall Fescue
c. 25 percent Firewall Tall Fescue
d. 10 percent Mercury Kentucky Bluegrass
e. 10 percent Express II Perennial Ryegrass

2.3 FERTILIZERS

A. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition:

a. 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
b. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

B. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:

1. Composition:

a. 20 percent nitrogen, 10 percent phosphorous, and 10 percent potassium, by weight.
b. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

2.4 MULCHES

A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.

B. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application; nontoxic and free of plant-growth or germination inhibitors.

2.5 PESTICIDES

A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

2.6 EROSION-CONTROL MATERIALS

A. Erosion-Control Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.

B. Erosion-Control Fiber Mesh: Biodegradable burlap or spun-coir mesh, a minimum of 0.92 lb/sq. yd. (0.5 kg/sq. m), with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches (150 mm) long.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
2. Protect grade stakes set by others until directed to remove them.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

A. General: Prepare planting area for soil placement and mix planting soil according to Section 329113 "Soil Preparation."

B. Placing Planting Soil: Place and mix planting soil in place over exposed subgrade.

1. Reduce elevation of planting soil to allow for soil thickness of sod.

C. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

D. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 PREPARATION FOR EROSION-CONTROL MATERIALS

A. Prepare area as specified in "Turf Area Preparation" Article.

B. For erosion-control mats, install planting soil in two lifts, with second lift equal to thickness of erosion-control mats. Install erosion-control mat and fasten as recommended by material manufacturer.

C. Fill cells of erosion-control mat with planting soil and compact before planting.

D. For erosion-control blanket or mesh, install from top of slope, working downward, and as recommended by material manufacturer for site conditions. Fasten as recommended by material manufacturer.

E. Moisten prepared area before planting if surface is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

3.5 SEEDING

A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h).

1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
2. Do not use wet seed or seed that is moldy or otherwise damaged.
3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.

B. Sow seed at a total rate of 2 lb/1000 sq. ft. (0.9 kg/92.9 sq. m).

C. Rake seed lightly into top 1/8 inch (3 mm) of soil, roll lightly, and water with fine spray.

D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets installed and stapled according to manufacturer's written instructions.

E. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre (42 kg/92.9 sq. m) to form a continuous blanket 1-1/2 inches (38 mm) in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.

1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

F. Protect seeded areas from hot, dry weather or drying winds by applying compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch (4.8 mm), and roll surface smooth.

3.6 HYDROSEEDING

A. Hydroseeding: Mix specified seed, commercial fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.

1. Mix slurry with nonasphaltic tackifier.
2. Spray-apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre (15.6-kg/92.9 sq. m) dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

3.7 SODDING

A. Lay sod within 24 hours of harvesting unless a suitable preservation method is accepted by Architect prior to delivery time. Do not lay sod if dormant or if ground is frozen or muddy.

B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.

1. Lay sod across slopes exceeding 1:3.
2. Anchor sod on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by sod manufacturer but not less than two anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below sod.

3.8 TURF RENOVATION

A. Renovate existing turf where indicated.

B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.

1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
2. Install new planting soil as required.

C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.

D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.

E. Mow, dethatch, core aerate, and rake existing turf.

F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.

G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.

H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches (150 mm).

I. Apply soil amendments and initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches (100 mm) of existing soil. Install new planting soil to fill low spots and meet finish grades.

1. Soil Amendment(s): according to requirements of Section 329113 "Soil Preparation.".

J. Apply seed and protect with straw mulch as required for new turf.

K. Water newly planted areas and keep moist until new turf is established.

3.9 TURF MAINTENANCE

A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.

1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
3. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.

B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches (100 mm).

1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
2. Water turf with fine spray at a minimum rate of 1 inch (25 mm) per week unless rainfall precipitation is adequate.

C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:

1. Mow Kentucky bluegrass, ryegrass, and fescue to a height of 1-1/2 to 2 inches (38 to 50 mm).

D. Turf Postfertilization: Apply commercial fertilizer after initial mowing and when grass is dry.

1. Use fertilizer that provides actual nitrogen of at least 1 lb/1000 sq. ft. (0.45 kg/92.9 sq. m) to turf area.

3.10 SATISFACTORY TURF

A. Turf installations shall meet the following criteria as determined by Architect:

1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches (125 by 125 mm).
2. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.

B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.

3.11 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.12 CLEANUP AND PROTECTION

A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.

C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.

D. Remove nondegradable erosion-control measures after grass establishment period.

3.13 MAINTENANCE SERVICE

A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:

1. Seeded Turf: 60 days from date of Substantial Completion.

    a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.

2. Sodded Turf: 30 days from date of Substantial Completion.

END OF SECTION 329200

SECTION 329300 - PLANTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Plant materials.
2. Fertilizers.
3. Weed-control barriers.
4. Mulches.
5. Herbicides and pesticides.
6. Landscape edgings.
7. Tree-watering devices.

B. Related Requirements:

1. Section 329200 "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.

1.2 ALLOWANCES

A. See Section 012100 "Allowances" for description of allowances affecting items specified in this Section.

1.3 COORDINATION

A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS

A. Product Data:

1. Plant materials.
2. Fertilizers.
3. Weed-control barriers.
4. Mulches.
5. Herbicides and pesticides.
6. Tree-stabilization materials.
7. Landscape edgings.
8. Tree grates.
9. Tree-watering devices.

B. Product Data Submittals: For each product.

1. Plant Materials: Include quantities, sizes, quality, and verified sources for plant materials.

C. Samples for Verification: Actual sample of finished products for each of the following:

1. Organic Mulch: 1-pint (0.5-L) volume of each organic mulch required; typical of the lot of material to be furnished, in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Provide an accurate representation of color, texture, and organic makeup.
2. Weed-Control Barrier: 12 by 12 inches (300 by 300 mm).
3. Slow-Release, Tree-Watering Device: One unit of each size required.
4. Edging Materials and Accessories: Manufacturer's standard size, to verify color selected.

1.6 INFORMATIONAL SUBMITTALS

A. Field Quality-Control Reports: Percolation tests for tree pits. Include the following:

1. Tree identification number matching the plans.
2. Date of test.
3. Time when water was added to tree pit to start percolation test.
4. Time with photo documentation showing increments of testing with water level in tree pit.
5. Identification of tester.

B. Qualification Statements: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.

C. Product Certificates: For each type of manufactured product, from manufacturer, and complying with manufacturer's certified analysis of standard products.

D. Pesticides and Herbicides: Product label and manufacturer's written application instructions specific to Project.

E. Sample Warranty: For special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.

1. Installer's Field Supervision: Maintain an experienced full-time supervisor on Project site when work is in progress.
2. Personnel Certification: Installer's field supervisor certified in one of the following categories from the National Association of Landscape Professionals:

   a. Landscape Industry Certified Technician - Exterior.
   b. Landscape Industry Certified Interior.
   c. Landscape Industry Certified Horticultural Technician.

3. Pesticide Applicator: State licensed, commercial.

B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.

1. Selection of plants purchased under allowances is made by Architect, who tags plants at their place of growth before they are prepared for transplanting.

C. Measurements: Measure in accordance with ANSI Z60.1. Do not prune to obtain required sizes.

1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches (150 mm) above the root flare for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the root flare for larger sizes.
2. Other Plants: Measure with stems, petioles, and foliage in their normal position.

D. Plant Material Observation: Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.

1. Notify Architect of sources of planting materials seven days in advance of delivery to site.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, or walkways and pavements; or on existing turf areas or plants.
2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
3. Accompany each delivery of bulk materials with appropriate certificates.

C. Deliver bare-root stock plants within 24 hours of digging. Immediately after digging up bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting. Transport in covered, temperature-controlled vehicles, and keep plants cool and protected from sun and wind at all times.

D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

E. Handle planting stock by root ball.

F. Store bulbs, corms, and tubers in a dry place at 60 to 65 deg F (16 to 18 deg C) until planting.

G. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

H. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Heel-in bare-root stock. Soak roots that are in less than moist condition in water for two hours. Reject plants with dry roots.
2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
3. Do not remove container-grown stock from containers before time of planting.

4. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.10 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: April 1 – June 15.
2. Fall Planting: September 15 – October 31.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions in accordance with manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
   b. Structural failures, including plantings falling or blowing over.
   c. Faulty performance of tree stabilization, edgings, and tree grates.
   d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods: From date of Substantial Completion.

   a. Trees, Shrubs, Vines, and Ornamental Grasses: 12 months.

3. Include the following remedial actions as a minimum:

   a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
   b. Replace plants that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
   c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.

d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

PART 2 - PRODUCTS

2.1 PLANT MATERIALS

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; with tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); with crossing trunks; with cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots are unacceptable.
2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare in accordance with ANSI Z60.1.

D. Labeling: Label at least one plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for plant.

E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to ensure symmetry in planting.

2.2 FERTILIZERS

A. Granular Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:

1. Composition:

a. 0.75 lb/1000 sq. ft. (0.34 kg/92.9 sq. m) 3 percent of actual nitrogen, 4 percent phosphorous, and 3 percent potassium, by weight.

b. Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing laboratory.

B. Mycorrhizal Fungi: Dry, granular inoculant containing at least 5300 spores per lb (0.45 kg) of vesicular-arbuscular mycorrhizal fungi and 95 million spores per lb (0.45 kg) of ectomycorrhizal fungi, 33 percent hydrogel, and maximum of 5.5 percent inert material.

2.3 WEED-CONTROL BARRIERS

A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. (101 g/sq. m) minimum, composed of fibers inert to biological degradation and naturally resistant to chemicals, alkalis, and acids, formed into a stable network so that fibers retain their relative position.

B. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz./sq. yd. (162 g/sq. m).

2.4 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Type: Shredded hardwood.
2. Size Range: 3 inches (76 mm) maximum, 1/2 inch (13 mm) minimum.
3. Color: Natural.

B. Compost Mulch: Well-composted, stable, and weed-free organic matter, pH of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through a 1-inch (25-mm) sieve; soluble-salt content of 2 to 5 dS/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

1. Organic Matter Content: 50 to 60 percent of dry weight.
2. Feedstock: Agricultural, food, or industrial residuals; biosolids; yard trimmings; or source-separated or compostable mixed solid waste.

2.5 HERBICIDES AND PESTICIDES

A. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

B. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

C. Pesticides: Registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended in writing by manufacturer for each specific problem and as required

for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

2.6 TREE-STABILIZATION MATERIALS

A. Trunk-Stabilization Materials:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal (38-by-38-mm actual) by length indicated, pointed at one end.
2. Wood Deadmen: Timbers measuring 8 inches (200 mm) in diameter and 48 inches (1200 mm) long, treated with specified wood pressure-preservative treatment.
3. Flexible Ties: Wide rubber or elastic bands or straps of length required to reach stakes or turnbuckles.

2.7 LANDSCAPE EDGINGS

A. Steel Edging: Standard commercial-steel edging, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.
1. Edging Size: 1/4 inch (6.4 mm) thick by 5 inches (125 mm) deep.
2. Stakes: Tapered steel, a minimum of 12 inches (300 mm) long.
3. Accessories: Standard tapered ends, corners, and splicers.
4. Finish: Manufacturer's standard paint.

a. Paint Color: Black.

2.8 TREE-WATERING DEVICES

A. Slow-Release Watering Device: Standard product manufactured for drip irrigation of plants and emptying its water contents over two to nine hours; manufactured from UV-light-stabilized nylon-reinforced polyethylene sheet, PVC, or HDPE plastic.
1. Color: green or black.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.

2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
3. Suspend planting operations during periods of excessive soil moisture until moisture content reaches acceptable levels to attain required results.
4. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove soil and contamination as directed by Architect and replace with new planting soil.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

3.3 PLANTING AREA ESTABLISHMENT

A. General: Prepare planting area for soil placement and mix planting soil in accordance with Section 329113 "Soil Preparation."

B. Placing Planting Soil: Place and mix planting soil in-place over exposed subgrade.

C. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 EXCAVATION FOR TREES AND SHRUBS

A. Planting Pits and Trenches: Excavate circular planting pits.

1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
2. Excavate approximately three times as wide as ball diameter for balled and burlapped stock.
3. Excavate at least 12 inches (300 mm) wider than root spread and deep enough to accommodate vertical roots for bare-root stock.

4. Do not excavate deeper than depth of root ball, measured from the root flare to the bottom of root ball.
5. If area under the plant was initially dug too deep, add soil to raise it to correct level and thoroughly tamp the added soil to prevent settling.
6. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.
7. Maintain supervision of excavations during working hours.
8. Keep excavations covered or otherwise protected when unattended by Installer's personnel.

B. Backfill Soil: Subsoil and topsoil removed from excavations may be used as backfill soil unless otherwise indicated.

C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.

D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub planting pits.

E. Fill excavations with water and allow to percolate away before positioning trees and shrubs.

3.5 TREE, SHRUB, AND VINE PLANTING

A. Inspection: At time of planting, verify that root flare is visible at top of root ball in accordance with ANSI Z60.1. If root flare is not visible, remove soil in a level manner from root ball to where the top-most root emerges from the trunk. After soil removal to expose root flare, verify that root ball still meets size requirements.

B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch (25 mm) above adjacent finish grades.

1. Backfill: Planting soil. For trees, use excavated soil for backfill.
2. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
3. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Distribute granular fertilizer around each planting pit when pit is approximately one-half filled. Do not place in bottom of the hole.

    a. Quantity: Two per plant.

5. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of root ball.

3.6 TREE, SHRUB, AND VINE PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin, and shape trees, shrubs, and vines as directed by Architect.

C. Prune, thin, and shape trees, shrubs, and vines in accordance with standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

D. Do not apply pruning paint to wounds.

3.7 INSTALLATION OF TREE-STABILIZATION MATERIALS

A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:

1. Upright Staking and Tying:

   a. Stake trees of 2- through 5-inch (50- through 125-mm) caliper. Stake trees of less than 2-inch (50-mm) caliper only as required to prevent wind tip out. Use a minimum of two stakes of length required to penetrate at least 18 inches (450 mm) below bottom of backfilled excavation and to extend at least 72 inches (1830 mm) above grade. Set vertical stakes and space to avoid penetrating root balls or root masses.

2. Support trees with bands of flexible ties at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

3.8 GROUND COVER AND PLANT PLANTING

A. Set out and space plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.

B. Use planting soil for backfill.

C. Dig holes large enough to allow spreading of roots.

D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to depth not less than two nodes.

E. Work soil around roots to eliminate air pockets and leave slight saucer indentation around plants to hold water.

F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

3.9 INSTALLATION OF MULCHES

A. Install weed-control barriers before mulching in accordance with manufacturer's written instructions. Completely cover area to be mulched, overlapping edges minimum of 6 inches (150 mm), and secure seams with galvanized pins.

B. Mulch backfilled surfaces of planting areas and other areas indicated.

1. Trees and Treelike Shrubs in Turf Areas: Apply organic mulch ring of 2-inch (50-mm) average thickness, with 12-inch (300-mm) radius around trunks or stems. Do not create a mulch cone or place mulch within 3 inches (75 mm) of trunks or stems.

3.10 INSTALLATION OF LANDSCAPE EDGINGS

A. Steel Edging: Install steel edging where indicated in accordance with manufacturer's written instructions. Anchor with steel stakes spaced approximately 30 inches (760 mm) apart, driven below top elevation of edging.

B. Shovel-Cut Edging: Separate mulched areas from turf areas, curbs, and paving with 45-degree, 4- to 6-inch- (100- to 150-mm-) deep, shovel-cut edge as indicated on Drawings.

3.11 INSTALLATION OF TREE-WATERING DEVICES

A. Provide one device for each tree.

B. Place device on top of the mulch at base of tree stem and fill with water in accordance with manufacturer's written instructions.

3.12 APPLICATION OF HERBICIDES AND PESTICIDES

A. Pre-Emergent Herbicides (Selective and Nonselective): Apply to tree, shrub, and ground-cover areas in accordance with manufacturer's written instructions. Do not apply to seeded areas.

B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and in accordance with manufacturer's written instructions.

C. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and in accordance with manufacturer's written instructions. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

3.13 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.

B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

3.14 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. Perform tree pit percolation tests.
2. Tree pit construction will be considered defective if it does not pass percolation tests and inspections.
3. Do not proceed with planting in tree pits until satisfactory percolation is demonstrated.

C. Prepare test and inspection reports.

3.15 REPAIR AND REPLACEMENT

A. Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Architect.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Remove and replace trees that are more than 25 percent dead or in unhealthy condition before end of corrections period or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

1. Provide new trees of same size as those being replaced for each tree of 6 inches (150 mm) or smaller in caliper size.
2. Provide Two new tree(s) of 4-inch (100-mm) caliper size for each tree being replaced that measures more than 6 inches (150 mm) in caliper size.
3. Species of Replacement Trees: Same species being replaced.

3.16 CLEANING AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

END OF SECTION 329300